TECHNOLOGY DEPARTMENT

APRIL 1950

The Paper Industry

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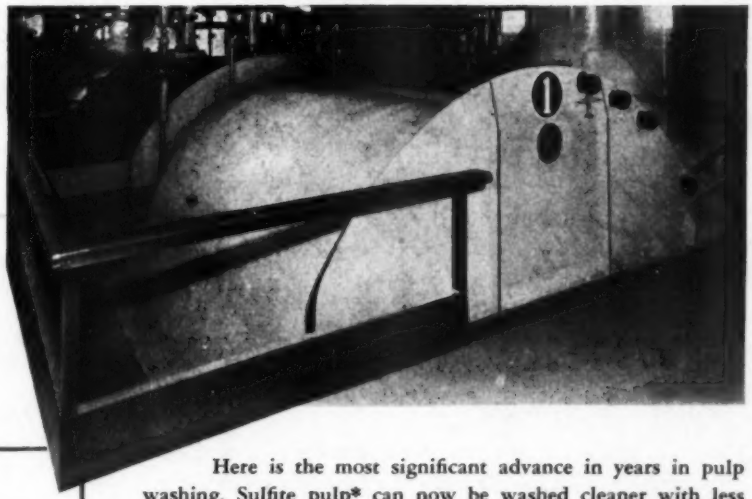
DETROIT

Cleaner Sulfite Pulp with Less Wash Water



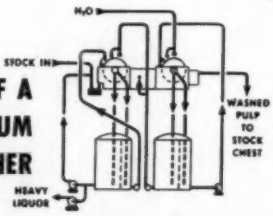
Here is the most significant advance in years in pulp washing. Sulfite pulp* can now be washed cleaner with less water, on Swenson-Nyman Pulp Washers. Each drum provides 2-stage washing, and the entire system is totally closed.

Using two drums with a repulper between (flow sheet shows resulting 4-stage operation) the sulfite stock emerges cleaner, while the recovered liquor carries a higher percentage of total solids to evaporators, alcohol plant or other recovery process.

Send for Bulletin E-108 which fully describes this and other Swenson equipment for pulp mills.

*Also soda and sulfate pulp

FLOW SHEET OF A TYPICAL 2-DRUM 4-STAGE WASHER



Swenson-Nyman Pulp Washers actually cost less installed, because each drum provides two washing stages. This reduces the number of drums required, as well as the amount of auxiliary equipment.

SWENSON

SWENSON EVAPORATOR COMPANY

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√R v. 32 April – Sept. 1950

Repeat Performance

WITHOUT VARIATION

Veteran actors admit there are never two performances exactly alike. That's because of the human element.

Cutter operators are human. They repeat the same settings, time after time, but never *exactly* the same. If it's close, it's considered good enough . . . but how many retrims, how many errors, how many rejects are cutting into your profits because of that human element?

Seybold has engineered the human element out of the new SPACER-TRIMMER. *ONE* setting for the series of cuts, at the beginning of the job—and from then on, every setting is automatic; every cut is *exactly* the same.

Trimming is nothing but a *repeat performance* in your finishing room. It's good business to engineer the human element out, to reduce error and increase production with the new SEYBOLD SPACER-TRIMMER!

*All Seybold Mill Trimmers cut with

ZZ-ACTION*

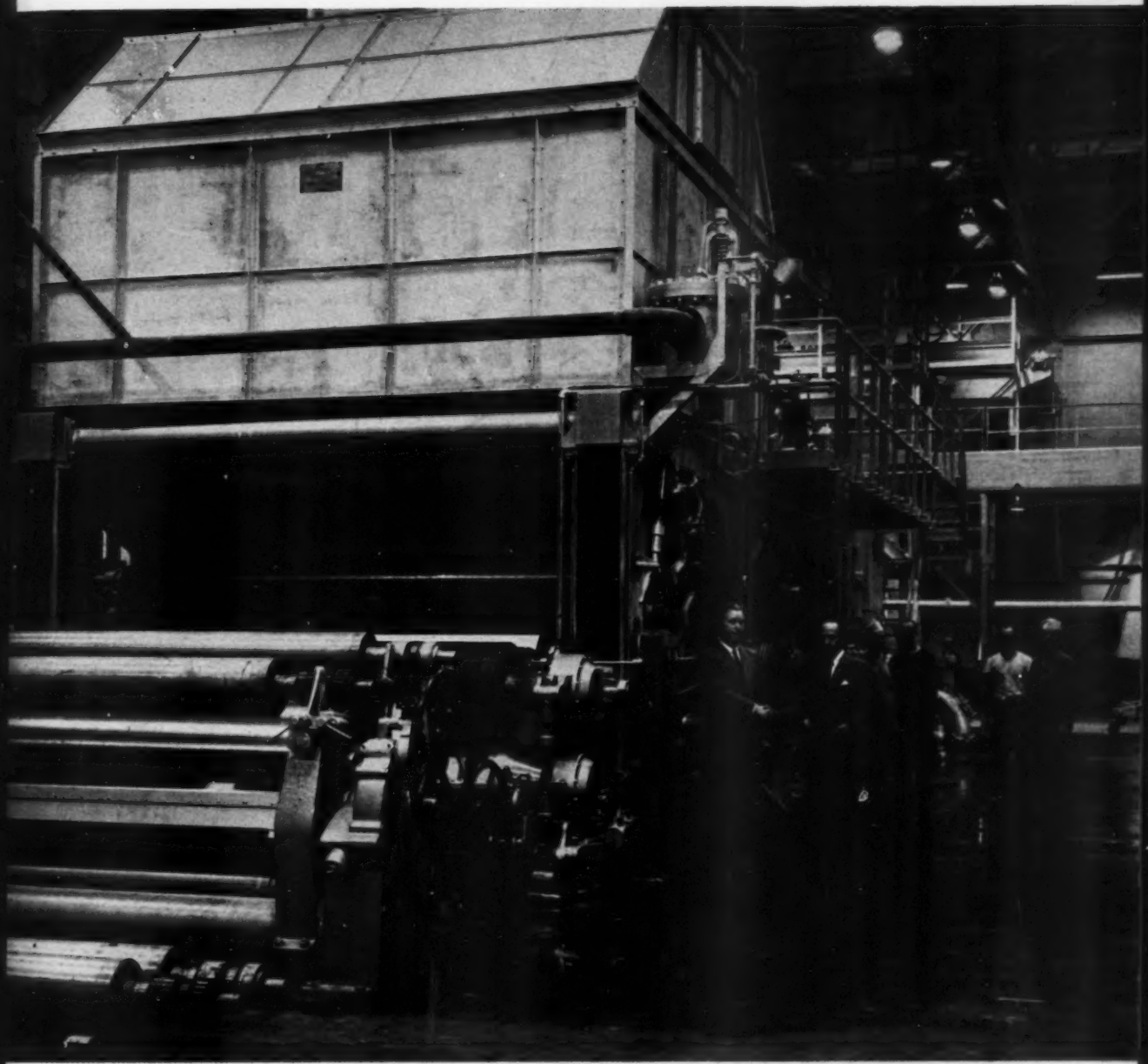
the exclusive Seybold method of putting the knife through the pile.

Tech.

HARRIS-SEYBOLD

4510 EAST 71st STREET • CLEVELAND 5, OHIO

Diamond Match: tissue and waxing



In the Plattsburg, N. Y., mill of the Diamond Match Company, Mr. J. O. Julson, General Manager of the Pulp & Paper Division, and Mr. B. O. Preu, Vice President, climaxed the company's recent expansion program with the start-up of "The Silver Streak," a fast, modern Beloit Yankee machine. In the background is one of the machine crews. The third Beloit machine to be built for this mill, "The Silver Streak," under the expert handling of these men, is achieving notable speeds and maintaining Diamond's high standards of quality.—*Beloit Iron Works, Beloit, Wisconsin.*

WHEN YOU BUY BELOIT...YOU BUY MORE THAN A MACHINE!

BELOIT

PAPER MACHINERY

95 Per Cent Efficient . . .

. . . recovering fiber stock from waste white water

That's how efficiently the 1000-gal.-per-minute Marx SAVEALL shown at the left operates at the Dallas, Texas, plant of Fleming and Sons, Inc.

Approximately 100 tons of paper board is produced every 24 hours at this plant. The SAVEALL reduces suspended fibrous solids in the waste water from 3.5 to 0.17 lbs. per 1000 gals.

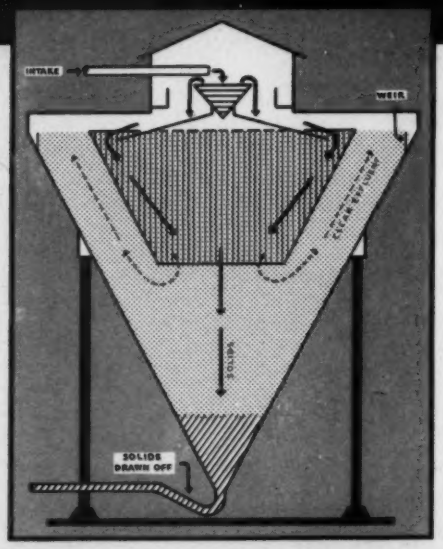
The Marx SAVEALL offers more than just efficient recovery. It operates by natural forces alone. No chemical coagulants are needed, the settlement taking place by gravity (see diagram below). No moving parts are involved and there is no opportunity for mechanical failures to occur.

How the *SAVE*ALL works

The Marx SAVEALL consists primarily of two large cones made of steel plates, one mounted inside the other, as shown in the diagram at the right. The inner cone is relatively short and thus has a large opening at the bottom.

There is a small cone-shaped receiving well at the top of the unit, with an inverted deaeration cone directly underneath it. At the Fleming plant, all overflow white water from the paper machine is collected in a common chest. This waste white water is fed into the receiving well at the top of the SAVEALL, overflows onto the deaeration plate (where the air bubbles are shaken loose from the solid particles) and runs off its edge. Suspended fibers settle through the inside cone and collect in the bottom of the outside cone. Water, minus most of the solids, rises between the two cones and flows over a circular weir into a draw-off channel.

The clarified effluent from this SAVEALL is returned by gravity to a storage tank in the mill and re-used in the beaters and white water showers. Overflow from the tank runs off to the sewer.



Marx SAVEALLS are typical examples of the special steel plate structures we build for paper plants and pulp mills. Let our engineers work with you on your next steel plate requirements.

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The Paper Industry

Technology • Engineering • Management • Production

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Features . . .

Fraser Companies' Newcastle Kraft Mill and Edmundston Bleachery 34
Downingtown Announces New Stock Preparation Equipment 45
Continental Paper Plant Has Resumed Operation 45
Paper and Paperboard Making—II 50
Stroboscope Aids Winder Operation 53
The Development and Transfer of Heat in Rotary Kilns 54
Solubilities of Waxes in Alcohols and Other Solvents 58
Design Features of Centrifugal Pump Shafts 60
Cuban Pulp and Paper Industry 63
Woodlands Section CPPA Holds 32nd Annual Meeting 66
Straw Pulp In Fine Paper Manufacture 88
Chlorine Dioxide Bleaching of Sulphate Pulps 90
TAPPI Abstracts 92-95
Index to Volume 31, *The Paper Industry* 107

News . . .

Industry News 45-48
Association News 66
Names in the News 71
Necrology 74
Allied News 76
Safety News 78
International Review 83

Departments . . .

Editorial 27-29
Current Comment 31
Paper Sketches 64
Coming Events 68
Convention Papers—Abridged 88-92
New Products 96-102
New Literature 104-106
Current Market Quotations 110-111
Index to Advertisers 112-113

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TAMES THE TOUGHEST VALVE SERVICES IN INDUSTRY

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Do YOUR piping systems include valve-killing services that build up excessive maintenance and replacement costs? If so, the new Jenkins Fig. 976-A Plug Type Bronze Globe Valve will produce important savings for you.

Install it where "wire drawing", due to close control of steam, knocks out other valves quickly—where entrapped chips, rust, or scale score the seats and start leaks. See how it defeats the worst valve enemies . . . how it sets new records for endurance and economy.

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MORE THREADS, LESS WEAR—Additional threads in bonnet and on spindle assure full thread engagement (open or closed), less load, less wear per thread.

NEW "TUFFARD" SPINDLE—Aluminum bronze (tensile strength exceeds 65,000 lbs.)—tough to take stresses, yet hard for long wear. Bigger in diameter, with more strong threads.

NEW SLIP-ON, STAY-ON PLUG—Simple design with T-slot for engaging spindle head is stronger, trouble-free, and permits free flow. Mirror-finished bevel assures perfect mating with seat ring.

NEW STURDY LUGS—Flat-faced, V-shaped lugs on union bonnet ring and body ends, permit firm fit and grip of open end, pipe or monkey wrench—withstand repeated disassembly.

500 BRINELL ARMOR SEAT Plug and Seat Ring of Jenkins JX-500 special alloy stainless steel—heat treated to 500 Brinell hardness and extraordinary ductility—lapped together to a mirror finish. Unaffected by throttled steam, resists galling, erosion, corrosion.

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Pulp Bleaching System

PULP bleaching methods developed by the Scandinavian firm of A/B Kamyr and recognized throughout the world for their superiority are available to the American paper makers in the *Sandy Hill*-KAMYR Pulp Bleaching System.

Kamyr attacked the problem of pulp bleaching at a time when direct chlorination first made its appearance on an industrial scale. Until then progress had been by steady but slow evolution, but this process started a period of revolutionary development. Kamyr made its start by introducing specially designed circulation pumps. Special Kamyr items already in use throughout the pulp industry were ultimately to form part of the KAMYR BLEACHING SYSTEM.

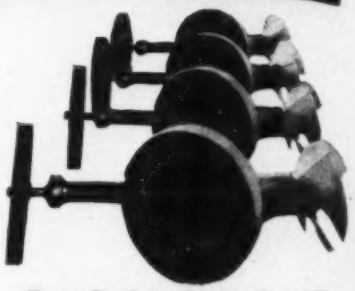
The soundness of Kamyr's theories developed and applied during these pioneering days has been proven by their adoption throughout the trade. Kamyr's emphasis on separate washing after each treatment, though long scorned, came to be accepted as standard procedure in *all* modern bleaching. The Kamyr vacuum washer meets any demand as to capacity, efficiency and resistance to chemicals.

Kamyr's solution for the efficient mixing and absorption of chlorine offers one of its strongest claims of superiority. Installation of a circulation pump at the base of the chlorination tower converts the bottom into a mixing chamber. The inlet and outlet of the pumps are connected tangentially to produce a strong horizontal circulation. The chlorine and pulp are thoroughly mixed. The pulp rises to the top of the tower and flows to the following washer.

Pre-Impregnation Process

The Kamyr patented process for pre-impregnation at low density for high density pulp assures excellent impregnation thus producing a more uniform pulp, a higher alpha content and an increased yield. *Sandy Hill's* staff includes an engineer with more than 20 years world-wide experience in the Kamyr organization available for consulting services.

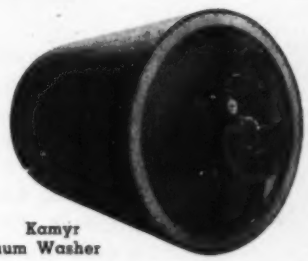
A brochure on the Sandy Hill-KAMYR *bleaching process, just off the press, will be sent upon request.*



Kamyr Circulation Pumps—Type CT

Kamyr Transport Pumps

Kamyr Feed Pumps



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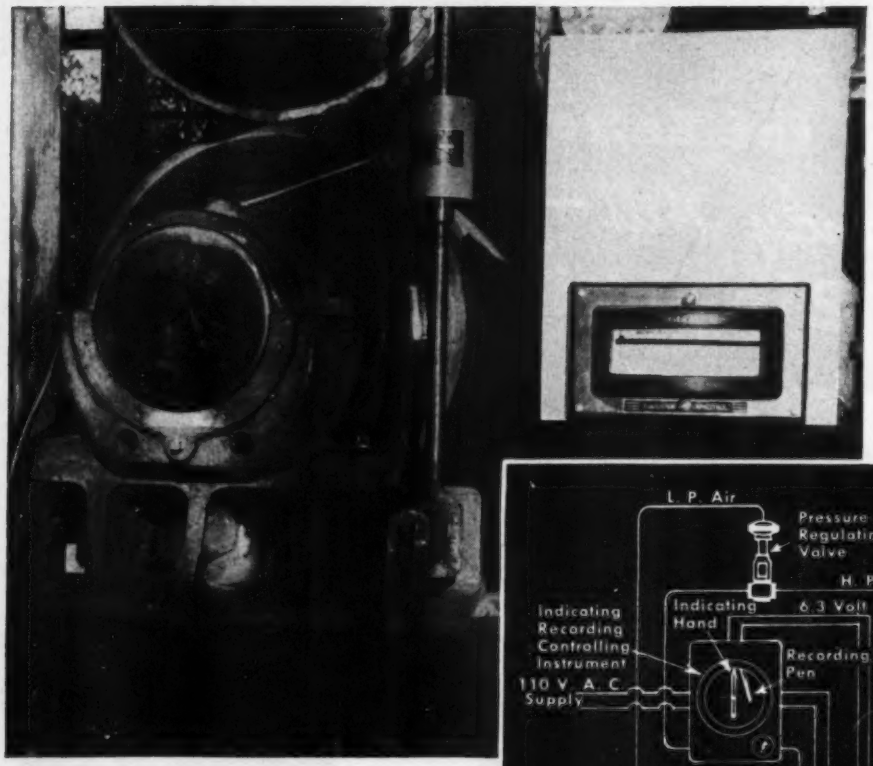
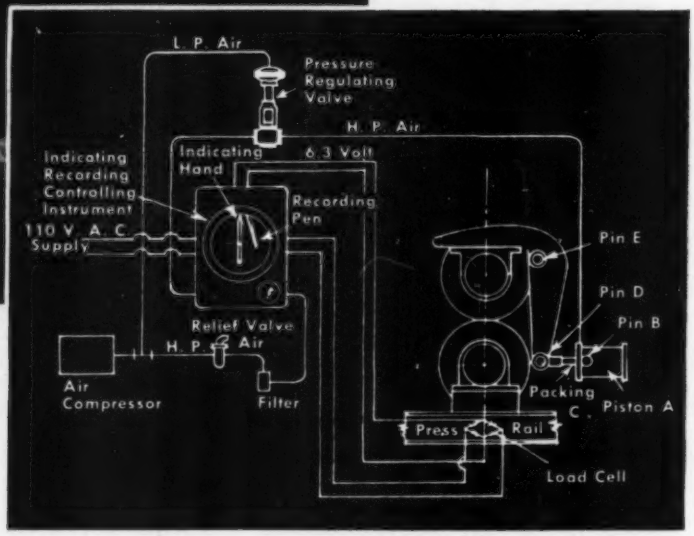


Photograph left and diagram below show Downingtown's new loading device. Note that all points A, B, C, D and E which may cause uneven loading are by-passed by the control system.



NEW and PROVED DOWNINGTOWN LOAD METER

Eliminates "Hit or Miss" Roll Loading

Every paper maker knows that it is practically impossible to maintain uniform nip pressures clear across a press roll with weights or by pneumatic or hydraulic cylinders. Even though every precaution is taken, there are too many variables—roll crowns, friction of fulcrum pins and cylinder packings, dull lever knife edges, etc. Therefore, even with equal weight positions on front and rear sides of a press, loading will vary appreciably between front and rear. Downingtown engineers have now solved this problem with a new and proved direct roll loading, recording and controlling device that eliminates "hit or miss" methods in roll loading. This load meter, utilizing the SR-4 bonded wire strain gage, has no moving parts to wear, does not change its calibration with constant use or with normal temperature changes, is simple, inexpensive to install, and accurate. Write for more information on this exclusive Downingtown load meter that assures accurate roll loading with consequent improvement in machine operation.

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DOWNINGTOWN, PA.

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Nalco

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✓ "PAPER MACHINES IN FINE CONDITION"

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"Beater Room Superintendent reported that paper machines were in very fine condition when examined during shutdown period over the weekend. Trays were reported in very good condition and much better than formerly noted. No sticking on press rolls. Oliver filter reported in good condition, no plugging. The Savalla Saveall reported in very good condition."

✓ NALCO ELIMINATED PITCH AND POPLAR WAX

In a mill manufacturing semi-chemical pulp, another Nalco Engineer reports:

"This company ran into considerable trouble recently from pitch and poplar wax in their semi-chemical corrugated medium. These waxes caused filling of wires and sticking of press rolls which in turn caused up to 30 breaks in a day. Nalco Pitch Control was applied at the fan pump and eliminated their trouble."

THE examples above are typical of the success and versatility of The Nalco System of Pitch Control in paper and pulp mills. Pitch-free operation saves time and money in these mills, and helps to produce a better product.

If you have pitch control problems, write Nalco for full data on the efficient, economical Nalco System as it may apply to your mill.

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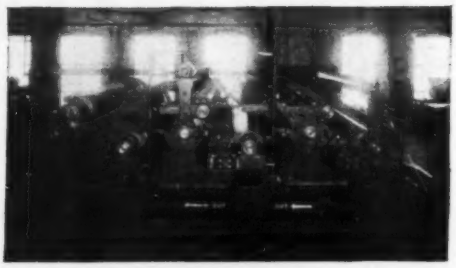
Why so accurate? Because the carefully balanced, heavy-duty cutter bars are driven by a greatly over capacity V-belt texrope drive, to assure accuracy regardless of shock. Because the knives are of high speed steel, and for a dozen other potent reasons.

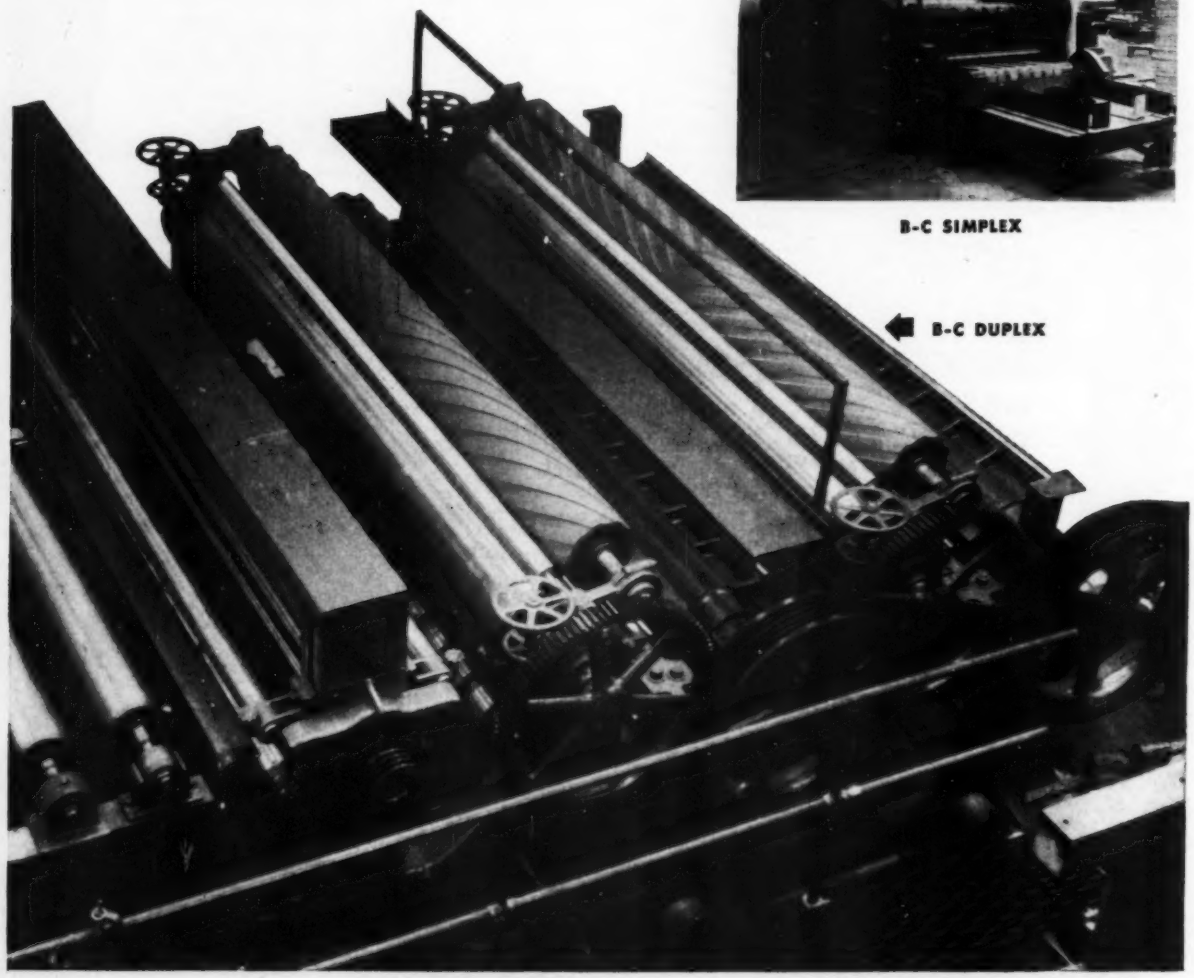
Incidentally, the use of a texrope drive permits the knives to be reset for square without loss of driving efficiency. Have us tell you more.



B-C TRIPLEX

B-C SIMPLEX

B-C DUPLEX



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Install Fast's on your Jordan equipment and *forget coupling problems!* Because Fast's Couplings reduce bearing wear, prolong life of motor and Jordan. They eliminate worn spots and the customary "hard spot". No motor subbase is needed because motor is set *solid* and *firm* with *all adjustments* made at the coupling!

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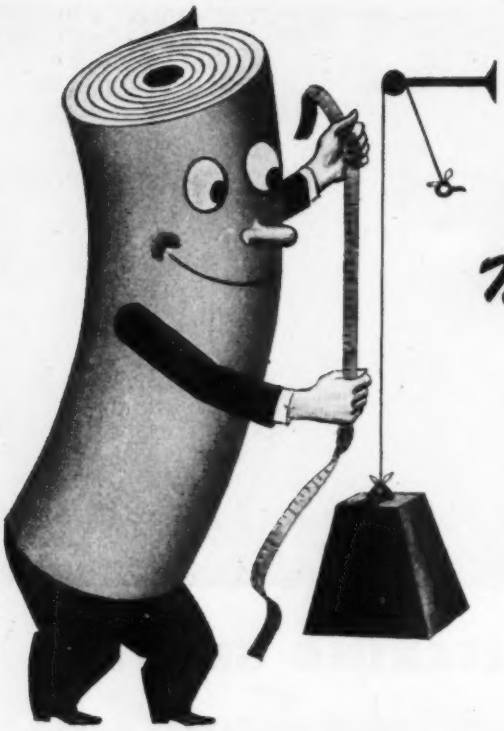

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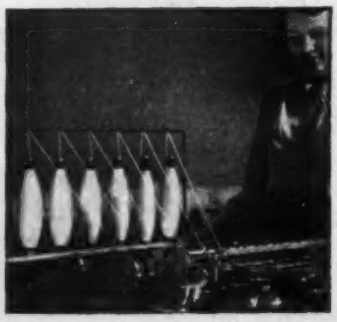

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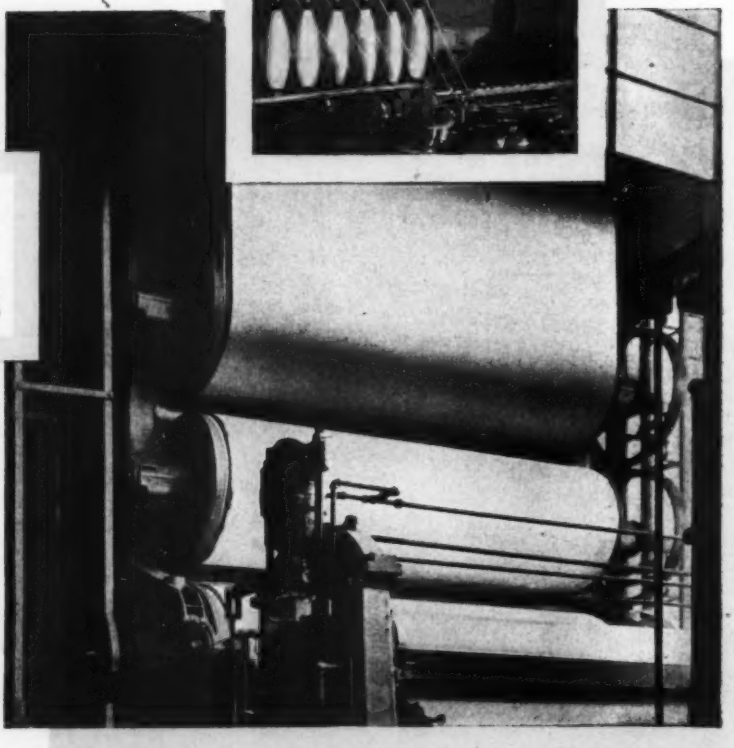
Gives You

Scientific Construction



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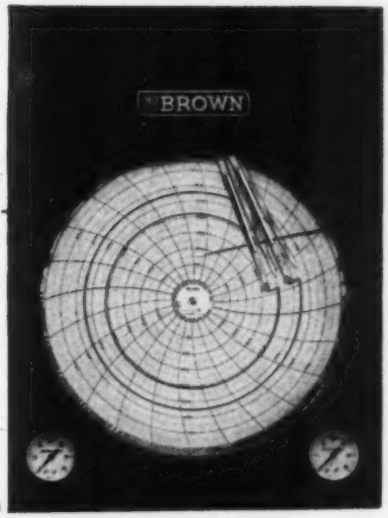

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FOR THE PAPER INDUSTRY

HERE'S A HOG THAT REALLY GOBBLES

...and it's SKF-EQUIPPED

Sumner Refuse Hogs, manufactured by Sumner Iron Works, grind hard and fast. They're built to stand the gaff of rugged service . . . and stand it they do. An important factor in their stamina is that arbor bearings are SKF heavy-duty spherical roller bearings. They carry both radial and thrust loads . . . save power and lubrication . . . require minimum attention. That's typical of the plus values SKF Bearings bring wherever they're installed.

For all SKF Bearings are engineered and made with industry's requirements in mind. They are the result of years of pioneering . . . rigid control of every step of manufacture . . . strict inspection. Result . . . SKF always puts the right bearing in the right place.

SKF Industries, Inc., Philadelphia 32, Pa., the Pioneers of the Deep Groove Ball Bearing — Spherical Roller Bearing — Self-Aligning Ball Bearing. 7095

SKF

BALL AND ROLLER BEARINGS

8 REASONS WHY SKF IS PREFERRED BY ALL INDUSTRY

INTEGRITY — CRAFTSMANSHIP — METALLURGY — TOLERANCE CONTROL

SURFACE FINISH — PRODUCT UNIFORMITY — ENGINEERING SERVICE — FIELD SERVICE

ADVERTISING should start at the wrapping counter

And it does, when retailers use distinctive, *colorful* wrapping paper, cartons and gummed tape. Color makes packages bright, and distinctive. It impresses customers and gives the store free advertising on the street, in buses and street cars.

It's an important *plus* for any retailer . . . and one that's commonly overlooked. So a big market is still open to the company that sells color for its *plus advertising value.*

Our Technical Staff will help you select the proper dyes for colored wrapping paper, cartons and tape. Cost, light fastness and other necessary properties are given careful consideration. Write E. I. du Pont de Nemours & Co. (Inc.), Dyestuffs Division, Wilmington 98, Delaware.

More color makes more business ...for your customers and you

DU PONT BASIC DYES

Du Pont Victoria Pure Blue BO
Du Pont Methylene Blue ZX
Du Pont Auramine Conc.
Du Pont Chrysoidine GN
Du Pont Basic Brown BR
Du Pont Safranine T Ex. Conc. 125%
Du Pont Rhodamine 5GDN Extra
Du Pont Rhodamine B Extra
Du Pont Fuchsine N
Du Pont Methyl Violet S Conc.
Du Pont Victoria Green Small Crystals

DU PONT ACID DYES

Du Pont Orange II Conc.
Du Pont Orange RO

DU PONT DIRECT DYES

Pontamine* Sky Blue 6BX Conc. 150%
Pontamine* Yellow SXP Conc.
Du Pont Stilbene Yellow G Conc.
Du Pont Stilbene Yellow GCB Conc.
Pontamine* Orange R Conc.
Pontamine* Fast Orange WS Conc. 175%
Pontamine* Fast Scarlet 4BS Conc. 150%
Du Pont Purpurine 4B Conc.
Pontamine* Black E Double
Pontamine* Brown D3GN Conc. 125%

* REG. U. S. PAT. OFF.

Du Pont Dyestuffs

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING ... *THROUGH CHEMISTRY*

for

UNIFORMITY

APPLETON FELTS

Appleton Woolen Mills

APPLETON WISCONSIN

VESSEL DIVISION

NEWS

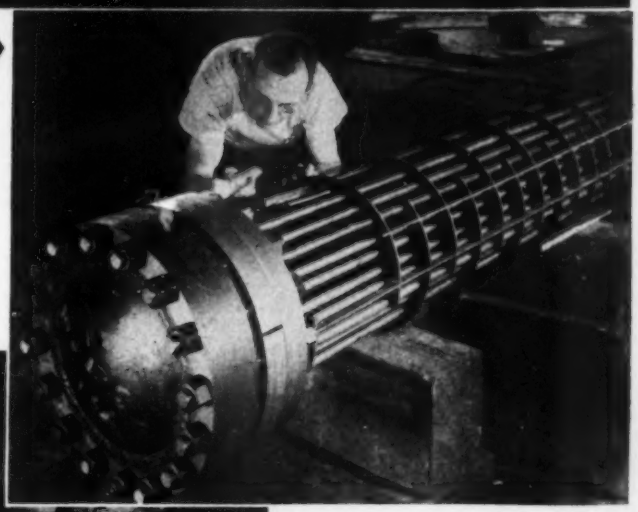
76th ANNIVERSARY 1874 - 1950

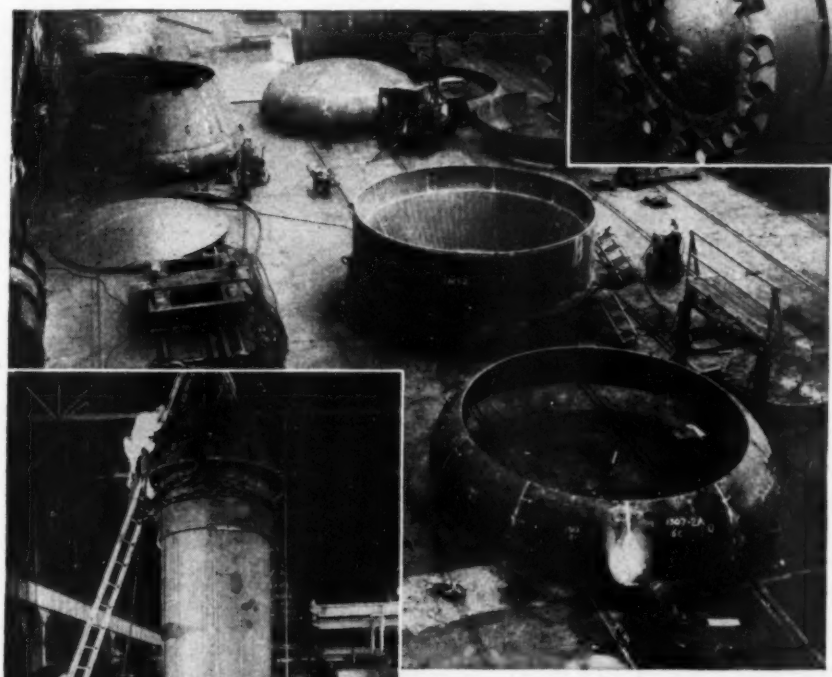
A.O.Smith

CORPORATION

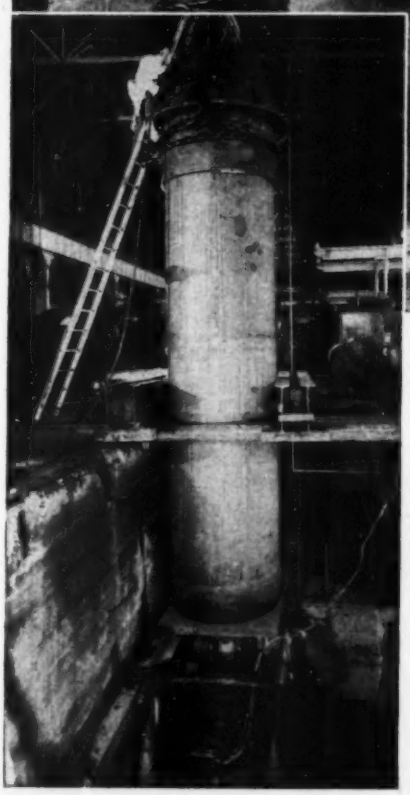
New York 17 • Boston 16 • Philadelphia 3 • Pittsburgh 19 • Chicago 4
Washington 6, D. C. • Atlanta 3 • Tulsa 3 • Dallas 1 • Houston 2
Seattle 1 • Los Angeles 14 • International Division: Milwaukee 1

HEAT EXCHANGERS FOR HIGHER PRESSURES. A. O. Smith solid-backing ring construction makes the split-ring floating head safe for higher pressures. Four exchangers, like the one shown here at the right, were built for one company and tested at 1875 lb. for a working pressure of 1250 lb.





SHIPPING LIMITATIONS, PLANT LOCATIONS, OR BUILDING CLEARANCES ARE NO BARRIERS. A. O. Smith can provide field-assembled vessels built and erected to shop-quality specifications. Shown at the left are part of the segmental cones and heads for six coke drums, to be field assembled. Each vessel will weigh approximately 220,000 lb. when completed.



MULTI-LAYER VESSEL CONSTRUCTION FOR HIGHER PRESSURES. This 24 ft. long by 4 ft. diameter Multi-Layer lined A. O. Smith Autoclave was given a running-in test in excess of the working pressure of 2,000 psi.

A. O. Smith Corporation, Dept. PI-450
Milwaukee 1, Wisconsin

Send the latest A. O. Smith Vessel Bulletins:

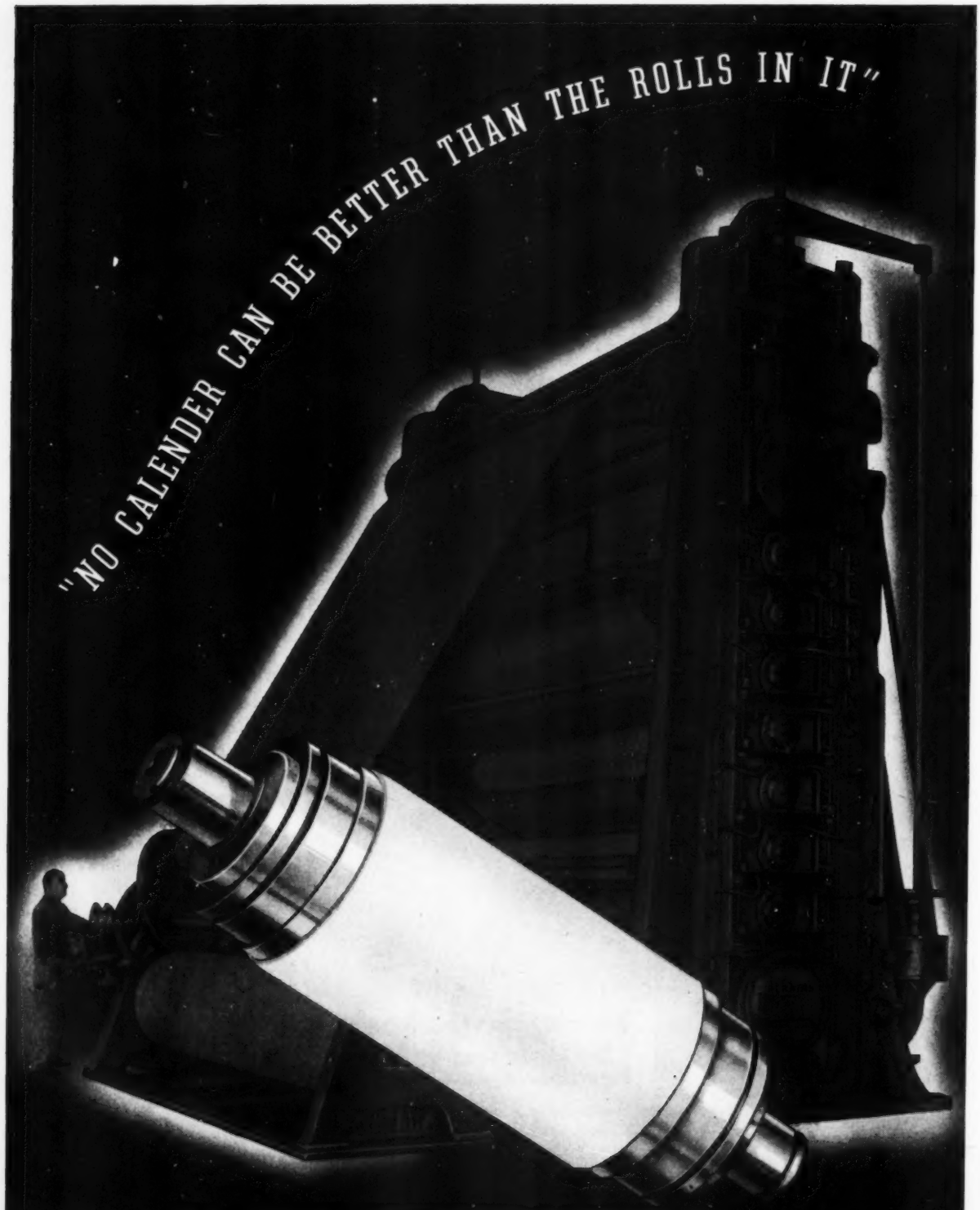
- ☐ V-46: Alloy, Alloy-lined, Clad, and Glass-lined Vessels
- ☐ V-44: Field Assembly of Pressure Vessels
- ☐ V-52: Multi-Layer Manufacture and Assembly

To:_____

Firm_____

Street_____ City_____ State_____

"NO CALENDER CAN BE BETTER THAN THE ROLLS IN IT"



B. F. PERKINS & SON, Inc.

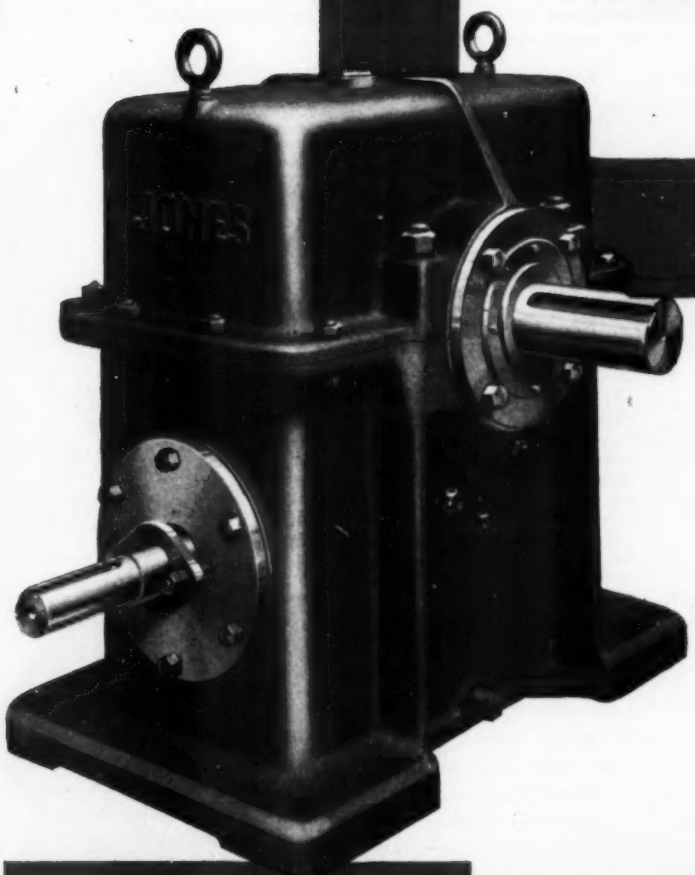
ENGINEERS AND MANUFACTURERS

HOLYOKE, MASS.

LARGEST MANUFACTURERS OF CALENDER ROLLS IN THE WORLD

Jones

WORM GEAR SPEED REDUCERS



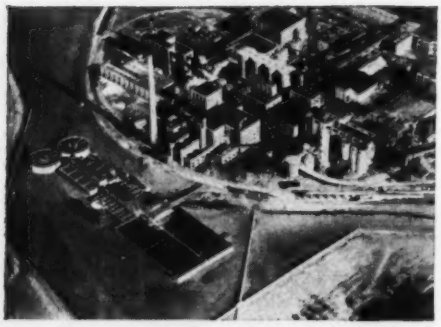
A right angle unit built for heavy duty performance in any industry. The worm can be above or below the gear. Shafts single or double extended for coupling connections or chain or gear drives.
They are built in ratios from 4 to 1 to 90 to 1 and in capacities from ¼ to 100 H.P.
Bulletin No. 68 covers selection tables and dimensions.

W. A. JONES
FOUNDRY & MACHINE CO.
4439 W. Roosevelt Road
Chicago 24, Ill.

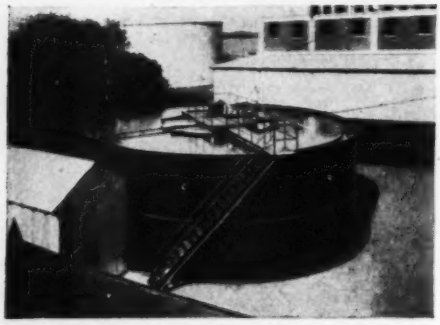
Since 1890
Jones

HERRINGBONE—WORM—SPUR—GEAR SPEED REDUCERS
PULLEYS • GEARS • V-BELT SHEAVES • ANTI-FRICTION
PILLOW BLOCKS • FRICTION CLUTCHES • FLEXIBLE COUPLINGS

DETROIT PUBLIC LIBRARY

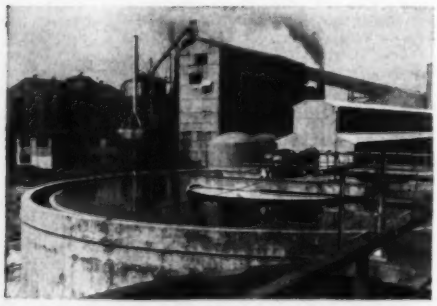


WEYERHAEUSER TIMBER CO., LONGVIEW, WASH.



NATIONAL CONTAINER CORP., JACKSONVILLE, FLA.

SCOTT PAPER CO., CHESTER, PA.



BRUNSWICK PULP & PAPER CO., BRUNSWICK, GA.

PAPER INDUSTRY USERS SPECIFY ACCELATOR® AGAIN AND AGAIN

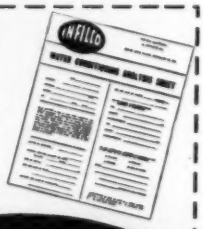
THE first installation of an ACCELATOR often results in *repeat sales.* Here's the finest kind of evidence of satisfactory performance, year after year. Regardless of the type of raw water supply, INFILCO Water Conditioning Service and Equipment will give you a consistently uniform, sparkling clear water, free of hardness, product damaging turbidity, discoloration, and foreign material. ☆The compact ACCELATOR *saves up to 80% in space!* Quick mixing, coagulation, settling, sludge removal . . all these steps are replaced in ONE efficient unit. Over 1100 ACCELATOR installations are now softening or clarifying almost ONE BILLION gallons of water *every day!* Get complete information. Write us for Bulletin 1825, or call in our nearest field engineer today!

MULTIPLE USERS OF THE ACCELATOR

NATIONAL CONTAINER CORP., Jacksonville, Fla.
NATIONAL CONTAINER CORP., Ontonagon, Mich.
NATIONAL CONTAINER CORP., Jacksonville, Fla.
NATIONAL CONTAINER CORP., Tomahawk, Wis.
NORTH CAROLINA PULP CO., Plymouth, N. C.
NORTH CAROLINA PULP CO., Plymouth, N. C.
INTERNATIONAL PAPER CO., Natchez, Miss.
INTERNATIONAL PAPER CO., Livermore Falls, Me.
INTERNATIONAL PAPER CO., Georgetown, S. C.
INTERNATIONAL PAPER CO., Panama City, Fla.
INTERNATIONAL PAPER CO., Georgetown, S. C.
WEYERHAEUSER TIMBER CO., Longview, Wash.
WEYERHAEUSER TIMBER CO., Springfield, Ore.
BRUNSWICK PULP & PAPER CO., Brunswick, Ga.
SCOTT PAPER COMPANY, Chester, Pa.
MEAD CORPORATION, Kingsport, Tenn.
NORTHWEST PAPER CO., Cloquet, Minn.
NORTHWEST PAPER CO., Cloquet, Minn.
KIMBERLY CLARK CORP., Niagara Falls, N. Y.
KIMBERLY CLARK CORP., Kimberly, Wis.

FREE LABORATORY SERVICE . . SEND FOR THIS WATER CONDITIONING ANALYSIS SHEET!

Make sure your water meets the exacting specifications you require. Send for our Water Analysis Sheet, then fill in and return it with a sample. You will receive our laboratory analysis and report promptly. A valuable INFILCO CHEMICAL CALCULATOR slide rule sent FREE to all who return our analysis sheet properly completed. *No cost or obligation is involved for this laboratory service.*



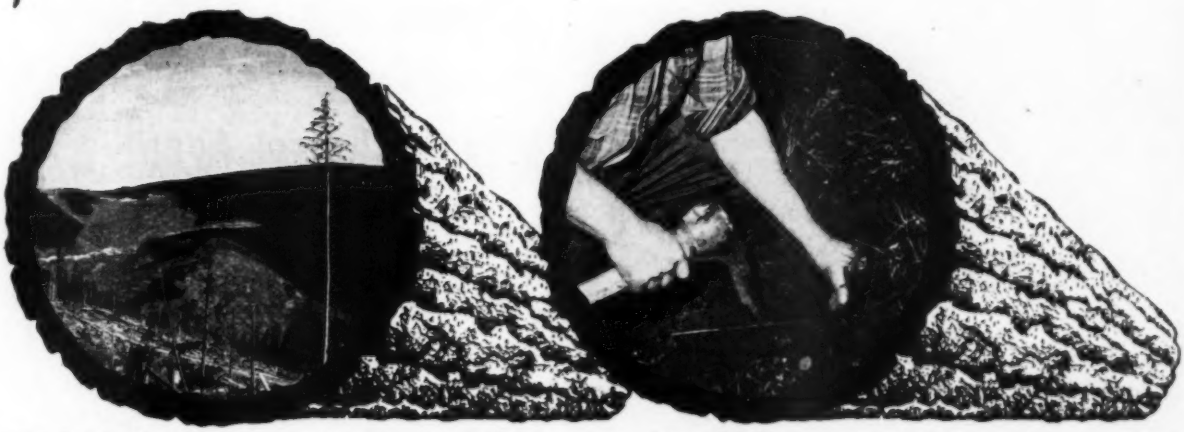
INFILCO
• BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1894

INFILCO INC.

SALES OFFICES IN TWENTY SIX PRINCIPAL CITIES

WORLD'S LEADING MANUFACTURERS OF WATER CONDITIONING AND WASTE TREATING EQUIPMENT

...this is Tree Farming



Seed Blocks Restock Cutover Land

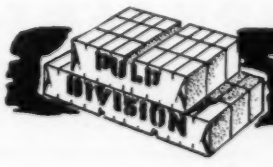
Hand Planting on Burnt-Over Areas

Young Second Growth on a Tree Farm

Spotter Plotting a Fire Location

A forest is not like an oil well or a mine... consisting only of a given amount of irreplaceable material. Forests are *living things*... and given a fair chance will reproduce themselves, barring complete destruction of the seed source. In fact, for years it has been a Weyerhaeuser tenet that..."Man cooperating with nature can provide a new forest as good or better than the original." To further implement this basic concept of forest management, Weyerhaeuser has joined others in the forest industry in establishing over two million acres of certified tree farms in Oregon and Washington.

The Pulp Division, Weyerhaeuser Timber Company, will benefit from this enlightened cooperative forest management program through a guaranteed source of supply for its sulphite and sulphate pulp mills.



WEYERHAEUSER

KELSIZE

Surface Control Agent

WORKS WONDERS

with *Wallpaper*

You get wallpaper coatings with smooth, fine texture, even color distribution, uniform coverage and high surface density when you use Kelsize, the modern surface control agent.

Kelsize helps promote clean, sharp printing... brings out true, even color values. Color penetration is regulated and mottle is reduced because pigment migration is under complete control. What's more, wallpaper prepared with Kelsize shows marked reduction in curling tendencies.

Easy to handle, Kelsize dissolves quickly in either hot or cold water. You'll find it's extremely economical, too. For full details write to our nearest regional office.

KELSIZE *a product of*

KELCO COMPANY

KELCO
REG. U.S. PAT. OFF.
REFINED ALGIN PRODUCTS

20 N. Wacker Drive
CHICAGO 6

31 Nassau St.
NEW YORK 5

530 W. Sixth St.
LOS ANGELES 14

Cable Address: Kelcoalgin — New York

At **MANDO**

American *DiesELectric*★
Locomotive Cranes

"Do twice the work at half the cost!"

They think in big figures, at Minnesota and Ontario Paper Company. When they proved to themselves that American 40-Ton DiesELectric Locomotive Cranes cut fuel costs in half, and doubled work output per crane, they saw *big savings* involved.

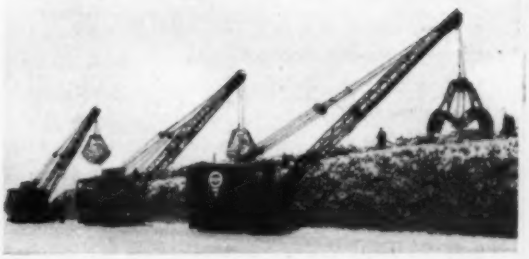
As a result, Mando is now replacing all steam cranes with swift, efficient American DiesELectrics . . . one for two. Each of the new machines handles about 30 carloads of wood on an 8-hour shift. One man runs each crane. There is no time out for steaming up, or for coal or water stops.

Do these figures make yours look out of date? Mail the coupon below, for facts on *modern* material handling.

★Diesel-Electric Locomotive Crane Patent No. 2083460.
Touch Control Patent No. 2370856.

FAST AND VERSATILE, these cranes handle car switching and many other jobs. This one is installing a 30-ton turbo-generator.

250,000 CORDS of pulpwood in the world's largest pulpwood storage facility. Mile-long yard contains 42 storage ranks, 20 feet high, served by both truck and rail cars.



THREE DO THE WORK OF SIX! The American 40-Ton DiesELectric shown here are doing work of six steam cranes. Each "bite" moves about three tons of wood. The 50 and 55 foot booms make a simple task of piling the pulpwood to a height of 20 feet.

American Hoist
& DERRICK COMPANY
St. Paul 1, Minnesota

Plant No. 2: SO. KEARNY, N.J.
Sales Offices: NEW YORK • PITTSBURGH • CHICAGO

American Hoist & Derrick Co. • St. Paul 1, Minn. 5802

Please send data on American DiesELectric Locomotive Cranes_____tons capacity.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

42

ST. REGIS PAPER COMPANY REPORTS ON 1949

SUMMARY OF CONSOLIDATED INCOME
FOR THE YEARS ENDED DECEMBER 31, 1949 AND 1948

	1949	*1948*
Net Sales, Royalties, and Rentals	$127,335,591.23	$162,672,925.94
Cost of Sales and Expenses	118,719,146.39	138,402,144.86
Operating Income	8,616,444.84	24,270,781.08
Income Credits	1,641,767.12	1,144,219.13
Gross Income	10,258,211.96	25,415,000.21
Income Charges	2,191,684.18	1,455,297.85
Net Income Before Provision for Federal and Foreign Income Taxes	8,066,527.78	23,959,702.36
Provision for Federal and Foreign Income Taxes	2,588,325.08	9,042,499.64
Net Income Before Deduction of Minority Interests	5,478,202.70	14,917,202.72
Deduct equity of minority holders of subsidiary's common stock in income	——	57,400.15
Net Income	5,478,202.70	14,859,802.57
Dividends Paid: Preferred Stock	$ 798,575	$ 828,208
Common Stock	3,102,428	4,136,571

Provisions for depreciation and depletion charged against income amounted to $5,376,929 for 1949, and $4,568,416 for 1948.

ST. REGIS
PAPER COMPANY

230 Park Avenue, New York 17, N. Y.

Offices in Principal Cities. In Canada: St. Regis Paper Co. (Can.) Ltd., Montreal

Products — Multiwall Bags and Bag Filling Machines . . . Printing, Publication and Converting Papers . . . Bleached and Unbleached Kraft Paper and Board . . . Bleached and Unbleached Kraft Pulp . . . Panelyte Laminated Plastics.

MORE THAN JUST A REFINER

Yes, each of these Sutherland Refiners, installed in a Southern Kraft mill, is more than just a Refiner—it's a Continuous Beating System in itself. With a Sutherland, there's no need to define beating and refining as separate operations, because both are accomplished by a single unit in a single pass operation. Here are four important advantages you get when pulp is treated by the Sutherland Continuous Beating System: (1) Rapid mullen development; (2) Retains higher tear and, with some pulps, shows a higher tear than the raw pulp over a wide freeness drop; (3) Produces equal mullen at higher freeness resulting in faster drainage, thus permitting increased machine speeds and higher production; (4) Less wet and dry broke, therefore less rehandling of broke and more net tonnage, and (5) Parallel operation permits great flexibility in stock preparation, rapid changes in grades and sheet characteristics. Write for recommendations on how the Sutherland Continuous Beating System can be put to work for you.

Sutherland Refiner Corporation

TRENTON, NEW JERSEY *Manufactured in the United States by Valley Iron Works Co., Appleton, Wisconsin*
Sutherland Refiner Limited, Windsor Hotel, Montreal, P. Q.

"Smart Guy ...the Boss!"

Tom: Remember how the boss gave us a Hamilton Felt for this machine when every customer was hollering for more tonnage?

Bill: Sure do. And he got the tonnage.

Tom: Now everybody is calling for fine finish and he gives us two Hamilton Felts instead of one.

Bill: Righto! And he is getting a swell finish on both sides of every sheet, in addition to the extra tonnage.

Tom: Smart guy. Knows his stuff.

Bill: 'Smart Guy' is right.

SHULER & BENNINGHOFEN, HAMILTON, OHIO

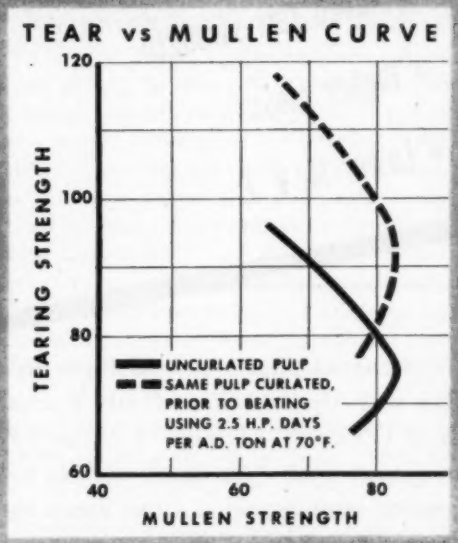
• Miami Woolen Mills •

Hamilton Felts

• Established 1858 •

Curlators Are Proving Their Value

Effect of Curlation prior to beating on the tear-mullen relationship during beating of a previously undried northern unbleached sulphite pulp.



TEST DATA

	HP/DT*	FREENESS	MULLEN	TEAR	DENSO-METER
UNCURLATED PULP	0	840	66.8	93	13
	1	810	77.6	83	34
	2	764	80.8	77	95
	3	672	84.0	75	260
	4	615	81.5	74	580
	5	521	70.8	60	1330
	7	394	66.5	55	3750
	9	285	64.6	54	5660
PREVIOUSLY CURLATED PULP	0	836	66.2	117	3
	1	770	82.8	95	22
	2	688	80.2	81	125
	3	575	76.8	72	360
	5	390	71.7	67	2640
	7	270	55.0	48	8280

*H. P. DAYS PER A. D. TON SPENT IN BEATING ONLY.

Note: Tear at maximum mullen of uncurlated pulp is 75, of curlated pulp 95.

Description of testing procedures employed by the Curlator Corporation Laboratory will be provided upon request.

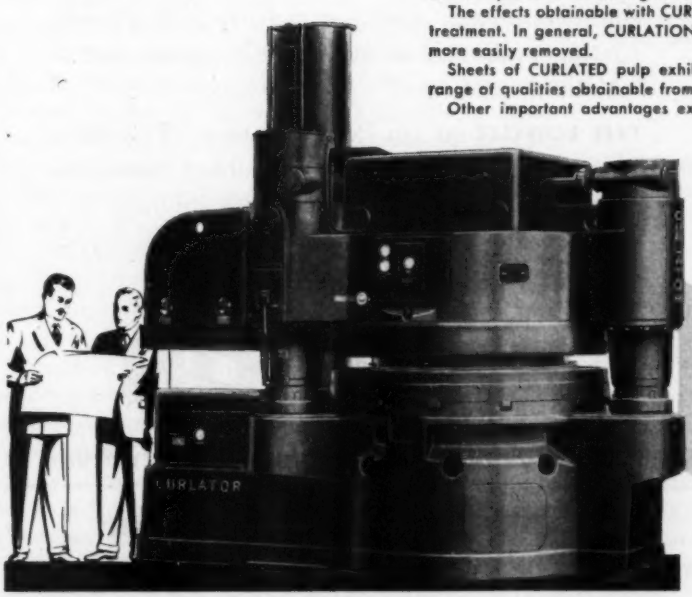
CURLATION is a new mechanical process for improving pulp properties, fully tested and thoroughly proved. Curlation not only produces a permanent change in the shape of pulp fibres, but also exerts a powerful de-shiving action, with negligible change in freeness.

The effects obtainable with CURLATION vary widely with the raw material and the conditions of treatment. In general, CURLATION tends to produce an easier beating pulp from which water is more easily removed.

Sheets of CURLATED pulp exhibit a more even textured matte appearance. In addition, the range of qualities obtainable from a given pulp is broadened.

Other important advantages exist . . . WRITE for new bulletin C-2 on the C-50 CURLATOR.

The CURLATOR is a tool for altering the properties of pulp and paper to obtain qualities hitherto unavailable by mechanical means. The effects of CURLATION vary with the raw material and may be described only in relation to a particular pulp.



CURLATOR† Corporation

565 BLOSSOM ROAD · ROCHESTER 10, NEW YORK

†T. M. Reg.—Curlator Corporation, Rochester, N. Y.

Give your wax coatings these extra sales points

- Added grease resistance
- Improved abrasion resistance
- Greater toughness
- Greater freedom from blocking
- Added flex strength
- Higher gloss
- Lower M. V. T.

AND AS PURE COATINGS . . .
"ALATHON" POLYTHENE RESINS

open up completely new markets for paper. These coatings are water-, chemical- and solvent-resistant, low in M.V.T., tasteless, odorless and non-toxic. They give paper a tough, glossy finish that stays flexible at extremes of temperature.

There's nothing like "Alathon" paper coatings for packaging acids, alkalis, oils and corrosive chemicals. In fact, "Alathon"-coated paper can be used where paper could never be used before!

Your wax-coated papers get all these sales advantages with the addition of only a small percentage of Du Pont "Alathon" Polythene Resins. Papers coated with "Alathon" and wax blends have greater sales appeal . . . give you a big competitive edge in your markets.

So, whatever wax-coated papers you produce, chances are "Alathon" can improve them. That includes bread, soap and frozen-food wrappers, locker paper, cake boards, butter cartons and countless others. And you can use your present coating equipment to lay down a smooth coat of "Alathon" and wax.

FREE BOOKLET on Du Pont "Alathon" Polythene Resins. Gives full information about these unusual coating materials—how they improve wax coatings, how they can be used as pure paper coatings. Write for your copy today.

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

ALATHON
(TRADE MARK)

Another Product for the Paper Industry from

Polychemicals DEPARTMENT
E. I. DU PONT DE NEMOURS & CO. (INC.)
WILMINGTON 98, DELAWARE

The Paper Industry

April 1950

Planned Research for Greater Profits

SURVEYS HAVE SHOWN that the paper industry spends about 0.7 per cent of its sales dollar for research in contrast to a general average of about 1.6 for all industry. The sixth largest industry in the country ranks about 15th when it comes to plowing back a portion of its income. While some paper manufacturers exceed the all industry average, there are many whose research efforts are negligible.

That research is essential to progress is generally believed. That it is necessary to successful operation is not so universally accepted. Many companies prefer to let someone else lead the way and are content to follow.

No doubt many concerns refrain from engaging in research because of the cost and the uncertainty of return. In many quarters the false belief still pervades that effective research is dependent upon finding and employing a genius. Nevertheless it has been demonstrated beyond all doubt during the past 25 or 30 years that competent, properly trained researchers under intelligent management are accomplishing the major objectives of research.

Basically there are two types of research—fundamental and applied. Fundamental research is the exploration of some field of science for any new knowledge. Applied research attacks specific problems using all available knowledge to develop or improve a product or process. It isn't always possible to distinguish one from the other, and in general one is pointless without the other.

Practically every manufacturer either consciously or unconsciously engages in applied research. His main objectives are to lower manufacturing costs, improve product quality, and develop new products. The very nature of our competitive system requires him to aim at these objectives in order to stay in business.

There is a difference, however, between the unplanned research forced by the expediencies of day to day competition and the planned program directed by an insight into the problems of tomorrow. For instance, a planned program to lower manufacturing costs might encompass the following major steps. First, each phase of the manufacturing process should be studied to determine the basic scientific laws underlying each operation. Second, each of the operations should be analyzed to find whether or not these basic principles are being employed in the most effective manner. From this analysis the weak spots in the operations may be determined and they in turn should be analyzed as to their cost in lost production time, lowered quality, or waste. Finally, steps should be taken to overcome these weak points. For a company whose research has been of a haphazard variety, this program could be the beginning of research on a thoroughly sound basis at moderate cost.

It is recognized, of course, that many companies, especially small ones, don't find it feasible to maintain a staff well balanced with respect to the various skills required for organized research. Here it is possible to utilize the services of such organizations as the Institute of Paper Chemistry, U.S. Forest Products Laboratory, and certain schools and colleges who are equipped to handle such problems. In many cases private consultants and consulting organizations are best suited for particular problems.

In a growing industry such as ours, the need for new and lower cost products is continually increasing. Those companies whose alert, foresighted management recognize the value of planned research will be the ones who will not only lead the way to new products and improved processes but also to new markets and greater profits.

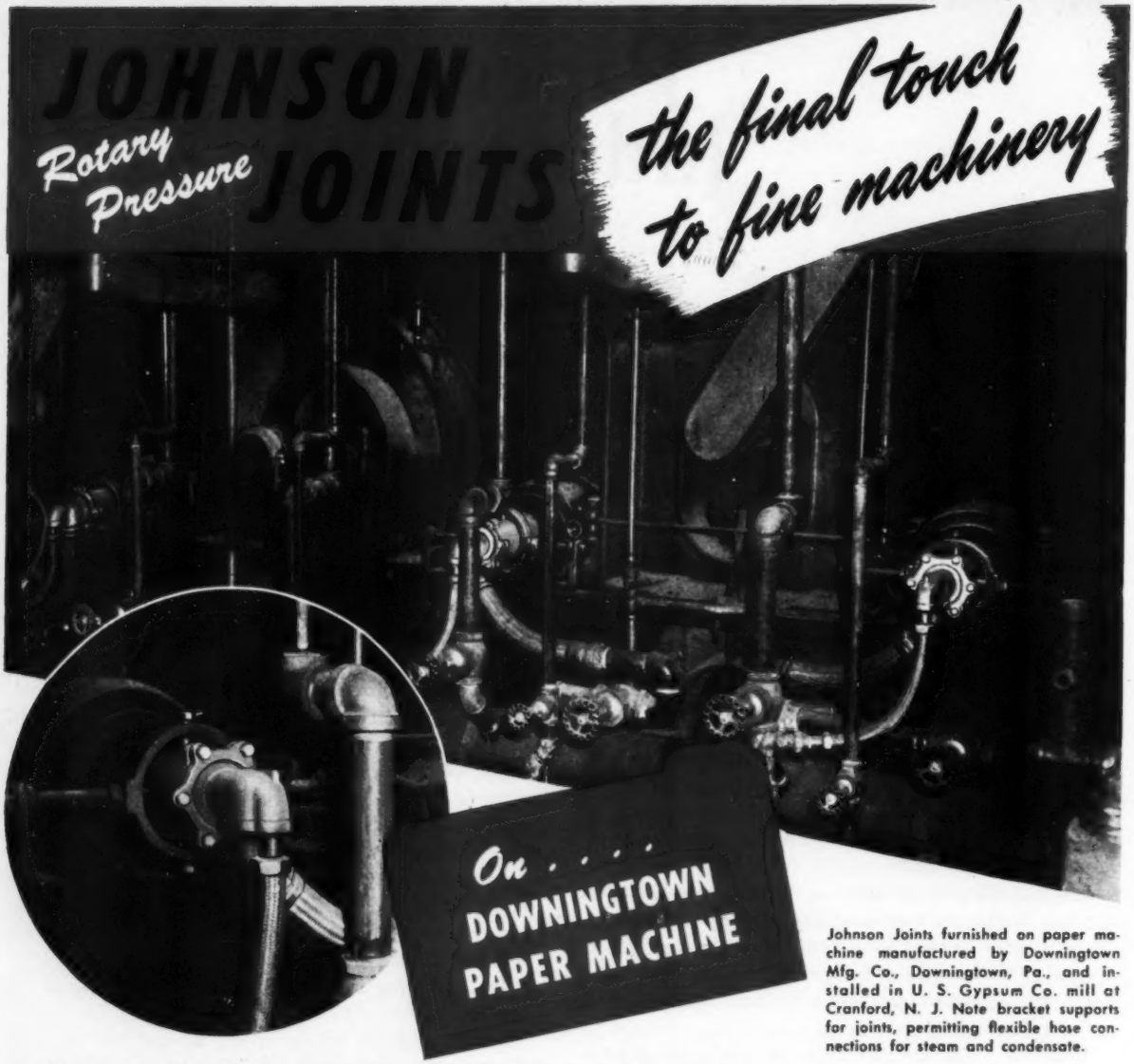
For Management and Labor

A RECENT REPORT THAT the Continental Paper Company is resuming operations after being shut down for several months marks another chapter in a somewhat unusual story of labor-management strife in the paper industry. For here was a case where labor benefited from a much heralded "share the profits" plan where the foundations of peaceful relations appeared to be set. Yet misunderstanding of one kind or another led to a protracted strike followed by a company announcement of a permanent shutdown. Community action was an important factor in bringing the dispute to an end.

Both sides of this bitter dispute have been aired in the newspapers and business press. Without com-

JOHNSON Rotary Pressure JOINTS

the final touch to fine machinery



On . . . . DOWNINGTOWN PAPER MACHINE

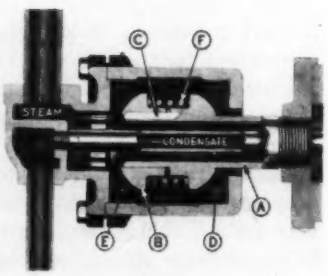
Johnson Joints furnished on paper machine manufactured by Downingtown Mfg. Co., Downingtown, Pa., and installed in U. S. Gypsum Co. mill at Cranford, N. J. Note bracket supports for joints, permitting flexible hose connections for steam and condensate.

Names like Downingtown Manufacturing Co. and U. S. Gypsum Co. need no introduction. And to both of these firms, as the installation above shows, Johnson Joints need little introduction.

It illustrates once more how machinery manufacturers and mill men agree, almost unanimously, that any paper machine, calender or corrugator is better machinery with Johnson Joints.

Their unmatched benefits are pointed out at right. And remember — the savings in maintenance alone can quickly pay the cost of switching over in your mill.

Styles, sizes for all needs; write for literature.



Completely Packless, Self-Lubricating, Self-Adjusting and Self-Aligning

Nipple (A) is connected to roll. Collar (B) is keyed to nipple at (C), but fits loosely so pressure can fill entire housing. Pressure is sealing force, consequently self-adjusting. Seal ring (D) and bearing ring (E) are of special carbon-graphite; they eliminate all packing or need for lubrication. Spring (F) is for initial seating only. Note room for lateral movement, spherical seating for angular movement.

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ment on their relative merits, however, we commend to both company and union (and to any other organization beset with strained and hostile labor-management relations) the studies made by the National Planning Association entitled Causes of Industrial Peace under Collective Bargaining. The first of these, which describes the relationship of the Crown Zellerbach Corp. and the Pacific coast pulp and paper industry with two unions (IBPSPW and IBPM), has been discussed at some length in these columns. (cf *The Paper Industry and Paper World,* November, 1948, and December, 1949).

Latest of these NPA reports deals with the Nashua Gummed and Coated Paper Co. and its seven AFL unions which have done business together for some fifteen strikeless years. Outstanding points that seem to fit the labor management peace pattern in this and earlier studies are as follows: The company accepts strong unionism as an asset, stays out of the unions' internal affairs and doesn't try to divide the members from their union. The unions accept the need for private ownership and the necessity for profitable operations. Both management and labor translate their mutual trust and confidence into everyday action. They consult frequently, share information and carry out negotiations bent toward achieving greater understanding of each other's problems. Bargaining is never legalistic. It centers on day to day problems, avoiding abstract principles. When agreements are reached both company and union concentrate on making them work.

There doesn't appear to be any set formula to achieving industrial peace. But it does take patience, hard work and good will—day in and day out. It comes from a very real desire of both management and labor for peaceful, profitable operations which benefit not only the company and its workers but the community as well.

The Paper Industry In a Stabilized Era

GENERAL BUSINESS for the first quarter of this year is finished. The paper industry is bowling along at a better-than-capacity production rate. There is no letup in the demand for its products. No let-down in the placement of orders has taken place since the big upsurge last August when the reversal in the overdone recession occurred. Every month since has shown a mounting increase in demand. October, 1949, output of 1,953,000 tons cracked the all time high weekly record.

For this year January showed an upturn of 6 per cent over January a year ago. Now February and March have come and gone, having done capacity operations plus. The mid-March week showed production running at 102.7 per cent of capacity compared with 91.4 per cent of the corresponding week of a year ago, and 101 per cent for the first week in March. A business barometer bulletin states "Paperboard used to make corrugated shipping containers is pouring from mills at a record rate—20 per cent over a year ago. This is a good indication that retailer orders for hundreds of consumer items packed in these boxes are running high. Manufacturers gear their container purchases to the flow of these orders."

And now this situation in the paper industry has caught the eyes of the daily press market writers who are referring to this large paper business volume as "a boom."

There is no "boom" in paper products. But there has come to the industry in these last eight months the healthiest and heaviest demand for paper products since 1948, and this demand will probably continue for some indefinite period in the future.

This desirable condition has come about because the postwar adjustment of the industry has at last been sanely and substantially accomplished.

The eight-month recession of 1949 was a blessing in disguise, and unrecognized by many industry operators. The net results have been that today the industry is more stabilized and in healthier condition than ever before, both as to tonnage and price bases. The recession was instrumental in revealing the facts that there is an irreducible minimum of orders that must flow continuously from converters and consumers to the mills in order to maintain the minimum supply necessary for efficient operation, and it also reveals the fact that the price structure of the industry is sound and fair. Look at the undeviating price of $100 a ton maintained for newsprint. Throughout the entire recession, and now for the eighth month thereafter, this price has remained firm and unchanged, an eloquent stabilizing factor to all concerned, particularly when newsprint consumption in the United States is about one-fourth of all the tonnage produced.

Then observe the board division whose output totals more than a fourth of all consumption, and which is enjoying continuous capacity demand. The price has remained relatively as firm as that of newsprint both before and after the recession of 1949. These two giant consumer items wield a mighty stabilizing effect upon the future operation of the industry. They insure confidence in the maintenance of ample supplies and at consumer acceptance of quality and prices.

Barring any unforeseeable catastrophe which might affect the entire economy of the nation adversely, we confidently expect that 1950 will be the high-record year for the consumption of paper products in the world.

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Standard: Lump; Ground, 99% thru 8 mesh, 95% thru 10 mesh; Powdered, 95% thru 100 mesh; Liquid, 32° Be.
Iron Free: Lump; approx. 2½", Ground thru 8 mesh, Liquid, 32° Be.

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- Disodium Phosphate *Anhydrous*
- Glauber's Salt *Crystal and Anhydrous*
- Hydrochloric Acid *(Muriatic)*
- Nitric Acid
- Sodium Bisulfite *Anhydrous*
- Sodium Fluoride
- Sodium Thiosulfate *(Hypo)*
- Sodium Metasilicate
- Sodium Silicate
- Sodium Sulfide
- Sulfuric Acid
- Tetrasodium Pyrophosphate *Anhydrous*
- Trisodium Phosphate
- Copper Sulfate
- Sodium Sulfite *Anhydrous*

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The Paper Industry Current Comment

Paper Prices & Output Remain Stable But General Business Faces Problems

▶▶▶ WITH PAPER PRODUCTION for this year averaging more than the rated capacity of the industry, and with backlogs of orders in most grades increasing, all forecasts of continued heavy business for the first half of the year are being justified. Now the question is: How much farther into 1950 the production will continue at these levels before there is a tapering off—if there is a tapering off this year.

Production appears merely to be keeping pace with consumption, and there has been little evidence as yet that the current flood of orders involves any material building up of inventories.

Parallel to the operation of the paper mills, pulp markets are strong with some increases in prices, with again no material indication that pulp consumers are adding to normal inventories.

A general picture of the industry appears to indicate that prices are back in many grades to the levels of a year ago, though this does not mean any material price increases. As a matter of fact, except for a comparatively short time, the downward trend of demand did not result in any radical price cuts, and a reversion to 1949 price levels did not involve any broad price increases.

A significant trend is the manner in which profit margins have dropped as compared with one and two years ago, while tonnage has kept up. Increased costs of manufacture and raw materials have curtailed net income as shown by figures of individual companies for 1949 as compared with 1948. It should not be thought that income is excessively low, but rather that profits have returned to an approximate normal. The paper industry always has been one of widespread differences between years of high profits and extended periods of low net return to investors. Hence, reduced profit reports should not induce pessimism on the part of ownership.

That the public is appreciative of the importance of the paper industry in the business picture is shown by recent analyses of market opportunities by various investment houses. Paper is usually a field which brokerage firms ignore in their recommendations to investors, but there is a distinct trend toward recognition by the investing public of the key position in industry held by the pulp and paper industry. Paper mill securities are more widely dealt in today than ever before in history. Depending on the viewpoint of the investment houses, different companies are selected as fields for profitable investment, but the range of offerings is steadily broadening.

Unemployment at Peak Since War

While the paper industry is still in the upward trend of its productive business cycle, general business conditions are not altogether bright. The American Federation of Labor has issued a survey of the labor picture which is inspired in part by the largest percentage of unemployment since the end of the war. Part of the unemployment picture is due to the effect of the coal strike on affected industries, but the Federation analysis urges studies of means by which new products, improved industrial operations and other factors should be brought into play to prevent the downward trend in the employment field.

Steel Gets Spotlight In Washington

At Washington, there seems to be no indication that the Administration has taken to heart the recent British elections with their indication that Socialism has nearly run its course. A most significant move is in the effort of Administration leaders to conduct an investigation of the steel industry, with a view to ultimately placing steel prices under some form of Government control. This is a modification of President Truman's original proposal that the Government be authorized to establish Government steel plants to meet industry demands for the product.

How to Separate "Big" from Bigness

Various moves to tighten up the laws against trade control by major manufacturing units are before Congress, in the form of bills to increase penalties for violation of antitrust laws and steps to spread business among smaller units.

A type of the results which can be expected has been found in the paper industry, indirectly, where a large industrial concern has bought the huge Ecusta cigarette company in North Carolina. Du Pont, which developed cellophane, found its operations threatened by Government because of its bigness and did not dare add to its manufacturing facilities in this field. Instead it facilitated the entrance of Olin Industries into the market, by licensing that company to produce cellophane, and some ten or twenty millions of dollars will be expended in building a cellophane industry as an affiliate of the big cigarette mill.

A product such as cellophane cannot be produced in a factory on a back street and other major manufacturing enterprises can be expected to develop in the same broad manner. In this instance the pronouncements of Washington on the need for the development of small business have been nullified. The development of small business is a fine theory, but an administrative attitude that a small business becomes a target of attack the moment it becomes prosperous is not conducive to too great optimism on the part of prospective investors. And that may be the reason the investing public is more willing to place its savings at work in conservative, though big, business enterprises, rather than risk capital on the unknown.

AN UNUSUAL PROPOSAL has been made to a group in the paper industry by a Washington spokesman who suggested that the domestic paper industry survey the field and assist in the campaign to

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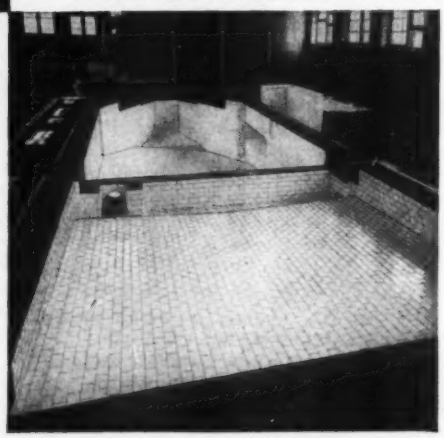

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increase imports by specific recommendation that certain forms of paper or paper products be scheduled for increased imports and for the abandonment of their production by domestic mills. "Agree to give up production of some papers," he said in effect, "and thus avoid the possible reduction of duties on grades which you are anxious to protect."

Financial

▶▶▶ WITH STOCK MARKET securities reaching a new high since 1946, paper mill issues generally joined the upturn, but in a modest degree. Public participation in market operations in the last month has reached a figure greater than at any time since World War II.

A.P.W. Products Co.—Loss for the year 1949 was $189,855 as compared with a profit of $170,699 in 1948.

Brown Co.—Net income for twelve months ended Nov. 30, was $1,091,710 as compared with $3,936,278 for the previous fiscal year.

Celotex Corp.—Net income for three months ended Jan. 31 was $250,689 as compared with $455,631 for the same period a year ago.

Certain-Teed Products Corp.—Net income for 1949 was $4,684,808 as compared with $6,599,907 in 1948.

Champion Paper & Fibre Co.—Net earnings for nine months ended Dec. 31 were $6,908,980.

Container Corp.—Net income in 1949 was $8,700,000 as compared with $10,424,000 in 1948.

Crown Zellerbach Corp.—Net income for nine months ended Jan. 31 was $13,924,396 as compared with $16,445,968 for the comparable period a year previous.

Eastern Corp.—Net income in 1949 was $12,726 as compared with $1,625,907 in 1948.

Fraser Paper Cos., Ltd.—Net income for 1949 was $2,937, 237 as against $5,599,748 in 1948.

P. H. Glatfelter Co.—Net earnings in 1949 were $692,313 as compared with $625,972 in 1948.

Hammermill Paper Co.—Net income for 1949 was $1,027,052 as compared with $1,402,972 in 1948.

Hinde & Dauch Paper Co.—Net income for 1949 was $2,388,621 as compared with $3,991,929 in 1948.

Hollingsworth & Whitney Co.—Net income in 1949 was $1,301,758 as compared with $3,570,355 in 1948.

Kimberly-Clark Corp.—Net income for 1949 was $8,733,254 as compared with $8,270,753 in 1948.

Marathon Corp.—Net income for nine months ended Jan. 31 was $1,182,932 as compared with $1,180,045 for the comparable period a year ago.

Masonite Corp.—Net income for six months ended Feb. 28 was $3,132,272 as compared with $2,748,404 for the comparable period a year ago.

Mead Corp.—Net income for twelve months ended Dec. 25 was $3,416,066 as

compared with $5,013,916 for the preceding fiscal year.

Minnesota & Ontario Paper Co.—Net income in 1949 was $3,409,702 as compared with $6,165,740 the previous year.

Oswego Falls Corp.—Net income in 1949 was $1,350,634 as compared with $1,065,056 in 1948.

Oxford Paper Co.—Net income for 1949 was $1,887,985 as against $1,855,075 for 1948.

Rayonier, Inc.—Net income for 1949 was $5,975,349 as against $10,287,045 the previous year.

St. Croix Paper Co.—Net income for 1949 was $1,115,186 as against $698,846 in 1948.

St. Regis Paper Co.—Net income in 1949 was $5,478,203 as compared with $14,959,802 in 1948.

Scott Paper Co.—Net income in 1949 was $5,626,609 as compared with $3,839,179 in 1948.

Smith Paper Co.—Net income for 1949 was $3,161,445 as compared with $3,377,622 the previous year.

United Board & Carton Co.—Net earningsfor six months ended Feb. 4 were $42,509 as compared with a loss of $23,026 for the comparable period a year ago.

United States Envelope Co.—Net profit in 1949 was $874,951 as compared with $758,026 in 1948.

Paper Mill Corporate Changes

Champion Container Co.—The Champion Container Co. of Philadelphia has been purchased by the Sonoco Products Company of Hartsville, S.C., and will continue in operation as the Champion Division of the Sonoco company.

New York Stock Exchange—Stocks

	Closing Prices March 25	February 25
A.P.W. Products	3¼	3¼
Celotex	19¼	19⅝
Same Preferred	17⅝	17⅛
Certain-teed Products	17⅝	17⅝
Champion P & F Co.	34	33⅝
Same Preferred	103	101½
Chesapeake Corp.	28½	25½
Continental Diamond	8½	9
Crown Zellerbach	33	33⅜
Same Preferred	104½	104½
Same $4 Preferred	104½	*103-104½
Dixie Vortex	39⅜	37½
Same "A"	56	52½
Eastern Corp.	14⅞	15
Robert Gair	7⅛	7⅜
Same Preferred	18⅛	18
Gaylord Container	19½	19⅜
International Paper	39⅜	36½
Same Preferred	105¼	104
Kimberly-Clark	29⅜	28⅞
Same Preferred	119⅜	115½
McAndrews & Forbes	41½	41
Marathon	29	28¼
Masonite	59⅜	59⅜
Mead Corp.	18½	17¼
Same Preferred	89¼	89
Same 2nd Preferred	38	35½
National Container	8	7⅝
Paraffine Cos.	17½	15⅝
Same Preferred	106¼	104
Rayonier, Inc.	27½	27⅝
Same Preferred	31⅜	31¼
Scott Paper	76⅜	69¼
Same $3.40 Preferred	96½	94⅝
Same $4 Preferred	106½	105½
St. Regis	8	7⅝
Same Preferred	87	88
Sutherland Paper	41¼	40
Same Preferred	110½	109⅜
Union Bag & Paper	29⅝	28⅝
United Board & Carton	8½	8⅝
United Wall Paper	3¾	3¾
Same Preferred	25	25½-27
U.S. Gypsum	117⅜	118
Same Preferred	187½	188
West Va. P & P Co.	47¼	48½
Same Preferred	*108¾-110	110

New York Stock Exchange—Bonds

A.P.W. Products 3⅝	*81-85	*81-82
Celotex 3½%	101	101
Champion P & F Co. 3⅝	103	103
Mead Corp. 3⅝	102½	102½

New York Curb Exchange—Stocks

Am Writing	6⅝	6⅜
Great Northern	41½	43¾

*Closing Bid and Asked Prices

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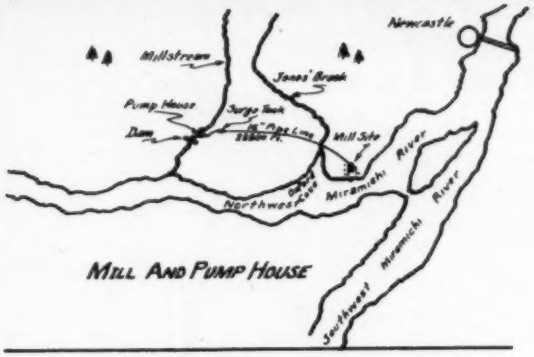
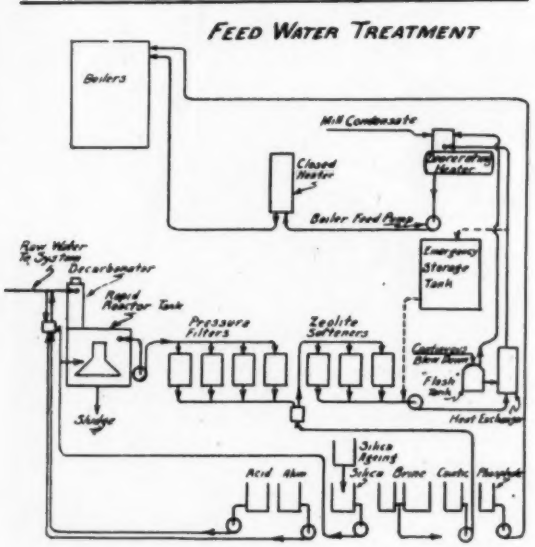
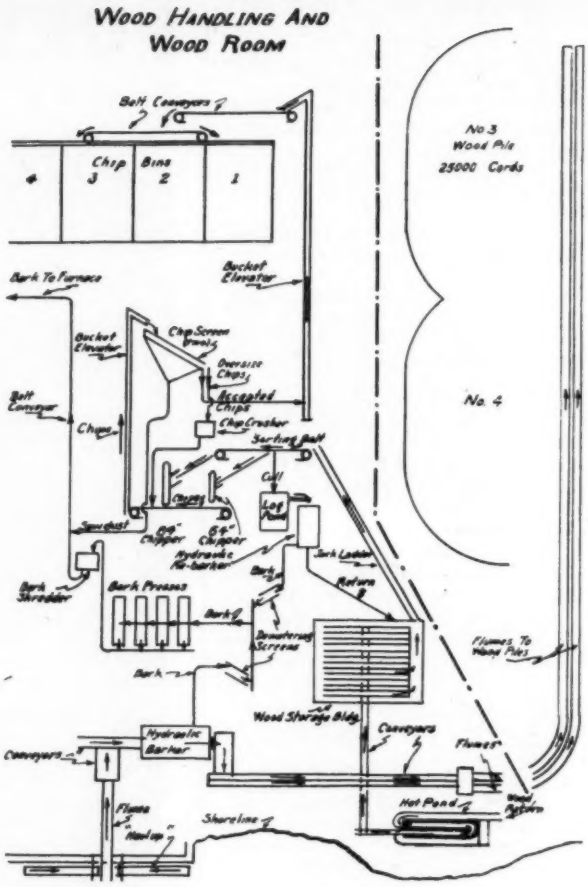






Fraser Companies' Newcastle

▶▶▶ ON THE SHORES OF the Northwest Miramichi River at Newcastle, N.B., a new kraft mill has just been completed by Fraser Companies, Limited. The pulp from this new plant will be transferred to a new bleachery at Edmundston, N.B.

The property along the Miramichi River was acquired in 1915 by Donald Fraser, pioneer, who arrived from Scotland in the spring of 1873, and with a group of colonists settled along the St. John River. From this beginning, the interests of Donald Fraser grew, and in 1916 a sulphite mill was constructed at Edmundston for the manufacture of pulp. The following year, all interests controlled by Donald Fraser and his sons were amalgamated into Fraser Companies, Limited, a Dominion company.

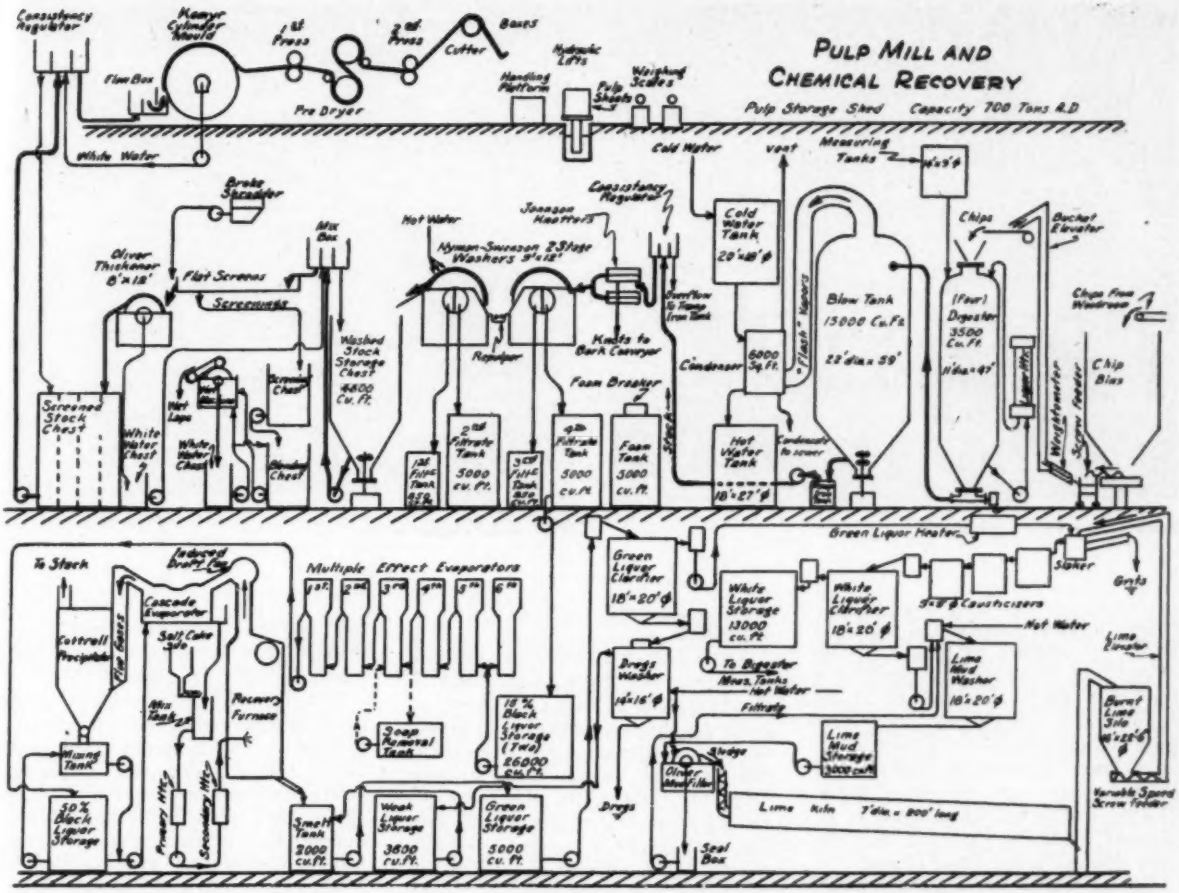
The period 1886 to 1932 saw three pulp mills come into production on the Miramichi River. The first record of a pulp mill was mention of the construction of a sulphite mill at Chatham in 1886. Unfortunately, the entire mill was destroyed by fire a year later, just as it was ready to start production. The mill was reconstructed and went into producing 75 tons of sulphite pulp per day. Two years later, the mill was shut down and was not operated until 1905, when it was incorporated as the Miramichi Pulp and Paper Co. The new company was liquidated in 1908 and 1909 and, soon afterwards, most of the mill burned.

Construction of the second sulphite mill on the Mirachimi had started in 1895. It was located on the opposite side of the river and about one mile below Chatham. Originally, the mill was known as the Masterman Sulphite Fibre Co., and it went into production in 1896 making 15 tons of pulp per day. By 1909, the name had been changed to Dominion Pulp Mill owned by Albert E. Reed and Co. This mill was expanded to 50 tons per day in 1916 and, four years later, was purchased by Fraser Companies, Limited, and operated by that company until 1932. It was later dismantled.

The third mill in the Miramichi district was the New Brunswick Sulphate and Fibre Co., constructed on the southwest Miramichi River at Millerton, about six miles above Newcastle. Construction was begun in 1901, and the mill started operations as a kraft pulp and paper mill. In 1914, it was largely destroyed by fire. By 1916, the mill had been rebuilt and was purchased by the Howard Smith Paper Mills Limited, and operated by that company until 1921.

Sulphate Pulp Mill

Now, in 1950, Newcastle takes on special importance as a pulp mill town. Designed to produce 120 tons per day of unbleached kraft, the new mill's output first will be bleached at the new bleach plant—then made into paper in Fraser's paper mills at either Edmundston (N.B.) or Madawaska (Maine).



Kraft Mill and Edmundston Bleachery

Wood Handling

A canal, 90 ft. long by 20 ft. wide, connects the upstream and downstream holding grounds and is the means for conveying wood to the two inclined jack ladders which are mounted back to back with their feed ends below the water level at either end of the canal. Each jack ladder has a two-chain drive with cross angle attachments and is approximately 43 ft. long by 10 ft. wide. They are located close to the north, or mill side, of the canal so that a clear channel of approximately 10 ft. is always available for sluicing logs from the upstream, or main, holding grounds to the downstream holding ground. The latter is essential for continuous operation in that it makes possible the handling of wood on the "in" tide.

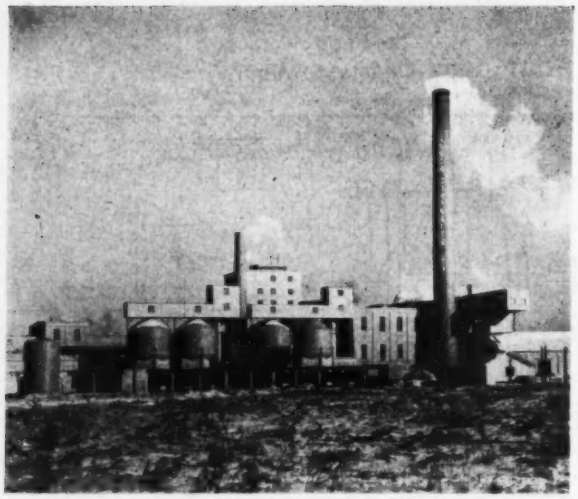
From the jack ladder, the logs drop to the first flume. This flume is 3 ft. wide by 3 ft. high and approximately 190 ft. in length and conveys the logs to the barker building. The flume has approximately a 1½ ft. drop and the sluicing water is continuously recirculated by two 10,000 gpm axial flow pumps.

A short two-chain 4 ft. wide conveyor elevates the logs from the flume to the feed end of the hydraulic barker. The resulting bark is sluiced to a dewatering screen then by a belt conveyor to the wood room where four giant Nekoosa presses (each with a capacity of 7,500 lb. per hour) remove more water. The bark at this point will still have 60-65 per cent moisture and is conveyed first to a Jeffrey 36 in. x 30 in. Type A swing hammer shredder, and then to a Hoff storage bunker over the auxiliary furnace. It can be fed continuously or intermittently to the furnace from storage.

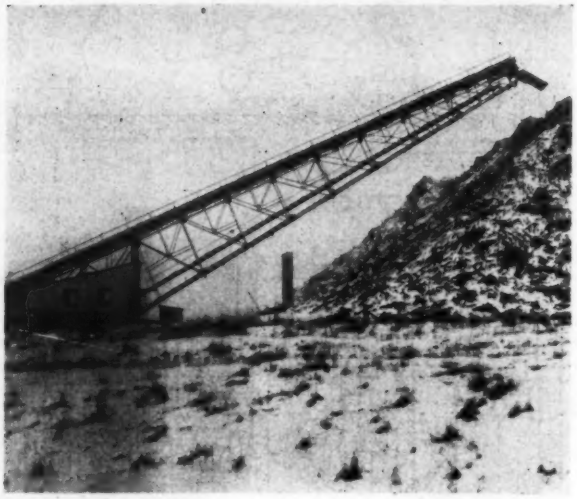
Hydraulic Barking

For bark removal, 1,400 gpm of water at 800 lb. psi pressure is supplied by a Canadian Ingersoll Rand six-stage Cameron pump driven by a Worthington-Moore condensing steam turbine and located in the turbine room. The barked logs from the barker are conveyed by a 3¼ ft. horizontal belt conveyor to inclined individual chain conveyors. All segregations of wood by species will be done in the barker building with the right species being diverted to the proper conveyor. Conveyors Nos. 6 and 7 continue inclined for approximately 332 ft. to an elevation of 46½ ft., and the wood is discharged to two parallel overhead wood stave flumes.

The flumes are 1,560 ft. in length and complete the travel of wood to the stackers. A special hopper arrangement discharges the wood from the flumes to the feed end of the stacker and the water drops to the return flume directly below. It is possible, therefore, to supply wood to the stackers and to reclaim wood from the piles to the mill at the same time and with the same water. Each wood pile has a capacity of 25,000 cords. Wood is reclaimed from the piles by underground



Fraser's Newcastle sulphate mill



No. 1 wood stacker

chain conveyors and fed into the lower flume for sluicing to the hot pond. Water from the hot pond is pumped to the upper flume and returned in the lower flume. A 16-inch wood stave pipe running alongside the lower flume at a lower elevation is available for feeding water into the lower flume. During the period when wood is reclaimed from the log yard, only the pipe line and lower flume is used.

The hot pond is essentially a double S channel with the logs and water from the lower flume entering at one end. The water is withdrawn at the other end of the channel and returned to the upper flumes or to the 16-inch pipe line. This forced circulation will convey the logs in the channel, and a single chain conveyor, 75 ft. in length, elevates the logs from the hot pond to the single chain inclined conveyor to the wood storage building. This latter conveyor is approximately 130 ft. in length to the south wall of the wood storage building.

An arrangement for by-passing stackers is provided and wood may be sent direct from barker to mill storage building. The wood storage building conveyor continues overhead for the full length of the building and is equipped with gates to discharge the wood directly below. The storage capacity of this building is estimated at 300 cords. A three-chain conveyor elevates the wood to the chipping floor of the wood room. A 5-ft. wide sorting belt conveys the logs to the chippers. Any wood requiring rebarking is manually pulled off the sorting table onto a belt conveyor and sluiced to the small hydraulic rebarker and returned to the system. The resulting bark is dewatered and pressed as previously described.

Chipping

Two Carthage 10-knife chippers, one 64 in. and one 84 in., right hand 16 ft. spout with a total capacity of 50 cords per hr. are installed. Chipper knives are sharpened on a Hanchett AK traveling wheel knife grinder. From the chipper, the chips are elevated by bucket conveyor to two Dillon, 6 ft. by 14 ft. shaker type, chip screens. The sawdust is conveyed to the bark conveyor for burning and the oversized chips are passed through a Waterous swing hammer crusher and returned ahead of the screens. The accepted chips are raised by bucket elevator to belt conveyors over the top of four chip bins. Each bin has an approximate capacity of 30 cords, or two digester charges, and a Williams & Wilson twin screw self-propelled chip feeder removes the chips from the bin and conveys them to a short inclined belt conveyor. On this latter conveyor, the chips are weighed automatically before being fed to a bucket elevator which delivers the chips to the belt conveyors feeding the individual hoppers over the digesters.

Pulp Cooking

Two liquor measuring tanks and one spare on the floor above the digesters are automatically filled and emptied to the digester. There are four digesters, each 11 ft. inside diameter by 47 ft. high and of 3,500 cu. ft. capacity, yielding approximately 7.5 tons of AD unbleached pulp. Each digester is equipped with heat exchangers for indirect cooking and circulating pumps. The liquor is drawn out of the bottom cone of the digester and returned to the top at the rate of 2,000 gpm. Bypass piping has been provided so as to continue circulation with direct cooking and to introduce direct steam through four nozzles positioned symmetrically around the bottom cone.

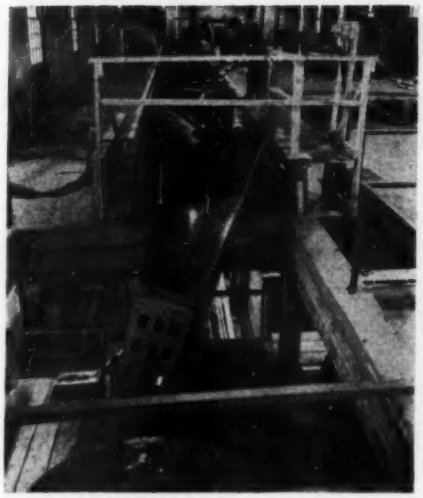
The digester features complete automatic cooking controls, a separator for turpentine, Yarway motor-driven blow valves and a conductivity system for determining contamination of condensate returned to the boiler house. The digester heat exchangers are two-pass equipped with 130, 1¼ in. No. 16 B.W.G., type 304 stainless steel tubes, each 15 ft. long with an effective heating surface of 637 sq. ft. per heater. The blow tank into which the digesters discharge is 22 ft. inside diameter by 59 ft. high and equipped with an agitator fitted with a Thermoverter unit for automatic consistency control.

A Swenson blow heat recovery system, consisting of a 6,000 sq. ft. surface condenser, recovers the heat in the vapors flashed from the blow tank. Automatic temperature controls regulate the flow of cold fresh water from an overhead 20 ft. diameter by 18 ft. high tank through the condenser to an 18 ft. diameter by 27½ ft. high hot water storage tank.

The resulting hot water is used for pulp washing, causticizing, and at the Kamyr pulp machine. To assure a flow of hot water at a uniform temperature, a temperature controlled heat exchanger utilizing low pressure steam, has been located after the hot water storage tank.

Washing and Screening

The consistency controlled stock from the blow tank passes through a 6 ft. diameter by 6 ft. high tramp iron collector tank and is pumped to a Waterous consistency regulator for further dilution with black liquor, and then to two Jonsson knotters in paral-



Belt conveyor feeds chipper

Digester operating floor

lel ahead of the Swenson black liquor washing system. An overflow line returns stock from the regulator to the tramp iron collector tank.

The washing system consists of two 9 ft. by 12 ft. Swenson-Nyman two-stage washers. There are four filtrate tanks, one for each stage; the last stage has a level controller with the excess black liquor being pumped to two 13,000 cu. ft. storage tanks. The first and third stage filtrate tanks have a capacity of 850 cu. ft. each, and the second and fourth stage filtrate tanks have a capacity of 5,000 cu. ft. each. In addition, vent lines from each of the filtrate tanks are connected to the same 5,000 cu. ft. foam tank equipped with a Sherbrooke Machineries foam breaker.

Suction at the washers is maintained by a L-8 Nash Hytor vacuum pump, equipped with an entrainment tower between washers and pump. Washed pulp from the last washer drops to the washed stock storage chest. This is a steel tank with a cone shaped bottom and fitted at the bottom with an agitator. An automatic consistency controller will maintain constant consistency of stock removed. From this chest, the stock is pumped to the screen room headbox for dilution and flow control and then over three lines of standard 14 Smythe flat screens with bronze vat. The rejects pass over a fourth line of screens and the tailings from this screen are sluiced to a 14 ft. diameter by 13 ft. high tile screenings chest. Each line is made up of three 14 plate sections. The plate slots are .010 in., .012 in., and .014 in. From the tile chest, the screenings are pumped intermittently to a 12 ft. diameter by 13 ft. high tile blending chest and, from this, to a Waterous wet machine. A 5 ft. diameter by 13 ft. high tile bank for white water from the wet machine completes the screenings system.

For final washing and thickening, the accepted pulp from the flat screens is conducted by wooden spout to an Oliver vacuum type ring valve filter, 8 ft. diameter by 12 ft. face. The washed thickened stock drops to the screened stock storage chest below the washer. This is a tile-lined four-compartment chest, and stock at 3½ per cent consistency is pumped from the chest to a Waterous consistency regulator ahead of the 136 inch trim P.M.L. Kamyr cylinder wet machine.

Kamyr Wet Machine

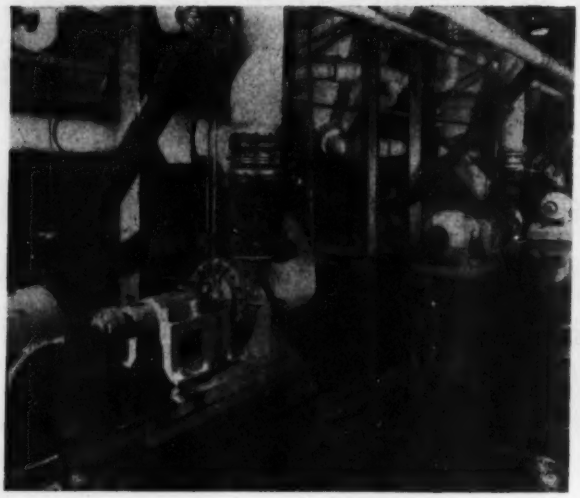
The Kamyr machine is equipped with feltless first and second presses. The cylinder mould as well as presses are equipped with pneumatic loading. Between the first and second press is one set of predryer cylinders, in which the steam is pressure controlled. The machine is further equipped with a 125-hp. d-c adjustable speed motor providing constant torque from 86 to 700 rpm, and a standard pulp cutter and slitter. The sheets of pulp will be lifted manually from the boxes and built up into skid loads. A gas-powered fork lift truck, 3,000 lb. load capacity, will convey the skid loads to a platform scale and from the scale either to storage or to freight cars. Effective storage area, one skid high, is estimated at 700 tons of air dry pulp.

Chemical Recovery

Thin black liquor (15 per cent solids) is pumped from storage to a John Inglis six body sextuple effect evaporator system and leaves the system at approximately 50 per cent solids. Each evaporator is equipped with 258 two-inch No. 16 B.W.G. stainless steel tubes 24 ft. long, with the exception of the first effect evaporator where there are 240 two-inch No. 10 B.W.G. tubes. Each evaporator has an effective heating surface of 2,800 sq. ft. Steam to the first effect is pressure controlled and the flow recorded.

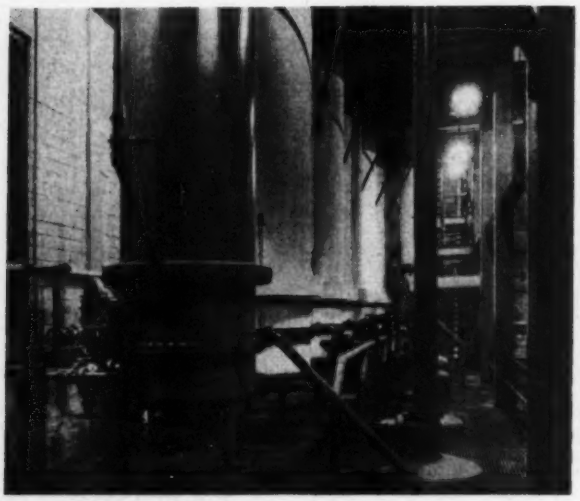
Thin black liquor is split-fed and flow controlled to the fifth and sixth effects. The Baumé of the black liquor in and out of the system is automatically recorded. A skimming system with a soap removal tank has been installed between the third and fourth effects. On the vapor side, leaving the last effect, there is a "catchall" tank, surface condenser, precooler, intercondenser, and two steam syphons, respectively. The heavy black liquor leaving the first effect is pumped from a flash tank to two steel storage tanks, each with a capacity of approximately 2,500 cu. ft., and located in the recovery building.

The recovery furnace is a Combustion Engineering, 50,000 lb. per hour, steam unit equipped with superheater. It will generate steam at 600 lb. psi pressure, and at 750 F. The hot flue gases from the furnace proper pass through cascade evaporators countercurrent to heavy black liquor from the storage tanks, and then through a Precipitation Co. of Canada Cottrell electrical precipitator to remove suspended matter from the flue gases. The precipitator is made up of three units and has a capacity of 60,000 cfm. At this capacity, 90-95 per cent of the suspended matter, largely sodium salts, will settle out. A hopper arrangement and screw conveyor below the precipitator conveys the collected solid material to a small solution tank where heavy black liquor from storage is used

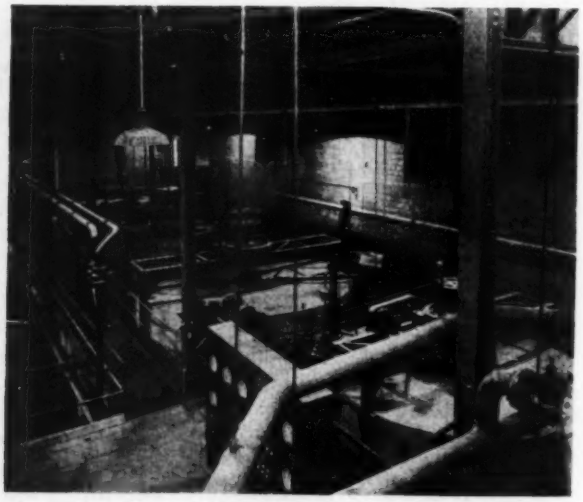


Digester circulating pumps

Swenson-Nyman brown stock washers



Six-effect black liquor evaporator



Dorr continuous causticizing system

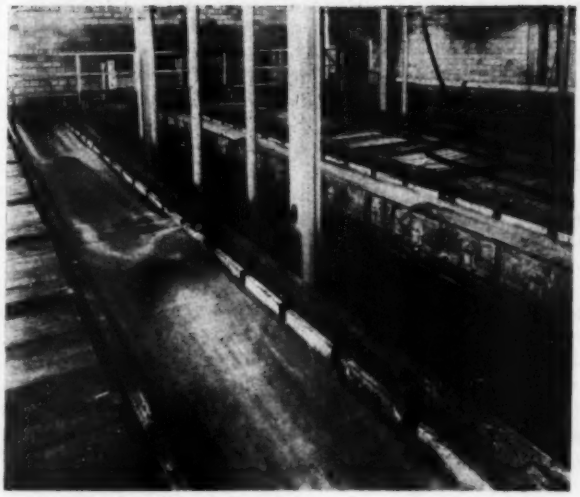
to dissolve the chemicals. This enriched black liquor is pumped to the cascade evaporators along with other black liquor from storage.

Salt cake is stored in two 750-ton storage silos outside the mill buildings and is elevated intermittently by conveyor to the 4½ ft. diameter by 11½ ft. high salt cake storage tank in the recovery building. From this latter storage, it is fed continuously by controlled screw conveyor to the salt cake mix tank, where it is put in solution with heavy black liquor from the cascade evaporators. The resulting black liquor will have a total solids content of 65-70 per cent and is pumped continuously through a primary and secondary liquor heater to two nozzles into the furnace proper and burned. The molten slag leaves the furnace hearth through a spout and falls into a tank to which there is continually added weak liquor. Automatic controls regulate the flow of green liquor from the smelt tank to the green liquor storage tank, as well as the flow of weak liquor to the smelt tank.

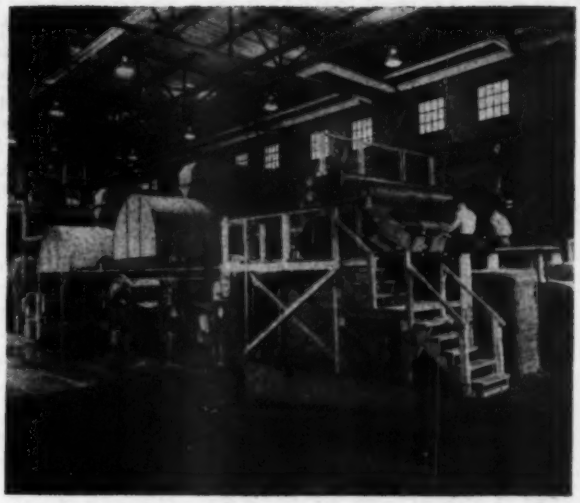
Liquor Making

The green liquor storage tank, with a capacity of approximately 5,000 cu. ft., is housed in the causticizing building, and is part of the Dorr continuous causticizing system. Green liquor is pumped at a controlled continuous rate to a three-tray four-compartment green liquor clarifier, 18 ft. diameter by 20 ft. high. The sludge from this clarifier is diluted with fresh water and pumped to a two-tray three-compartment dregs washer, 14 ft. diameter by 16 ft. high. The dregs from the bottom of this washer are pumped out and sluiced to sewer. The clear liquor overflow from the top compartment is used as wash water farther on in the system.

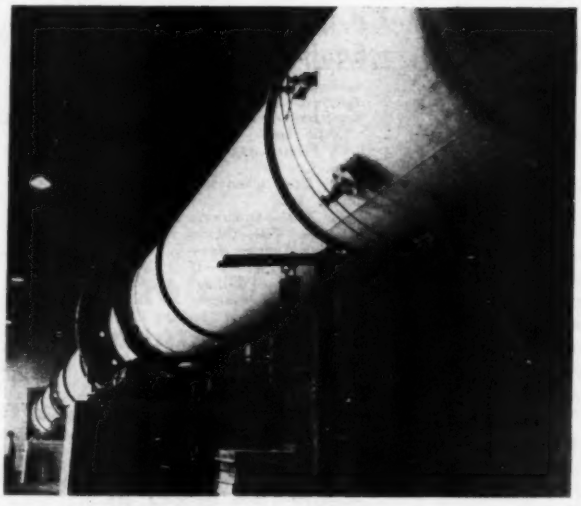
Returning to the green liquor clarifier, the clear overflow from each compartment is pumped to a No. 6 Dorrco lime slaker to which is also added a continuous measured amount of burnt lime. A 200 sq. ft. spiral type heat exchanger utilizing low pressure steam is installed in the liquor line between clarifier and slaker to maintain the temperature of the liquor to the slaker constant. Large undissolved particles are continuously discharged from the slaker. The lime and green liquor slurry overflows from the slaker through three 9 ft. diameter by 9 ft. high Dorrco causticizers in series to the three-tray, four-compartment Dorr white liquor clarifier, 18 ft. diameter by 20 ft. high.



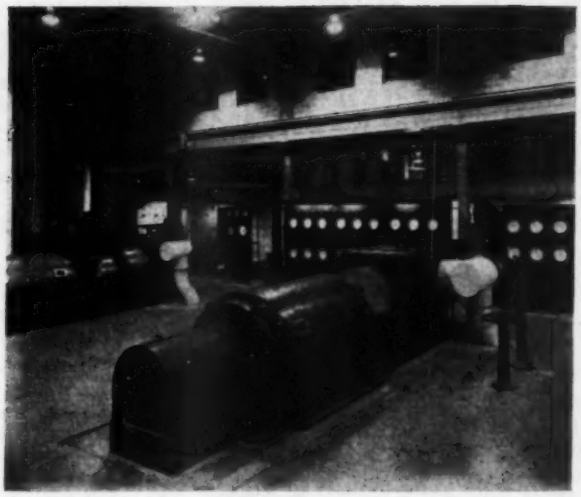
Flat screens



Kamyr cylinder wet machine



Traylor lime recovery kiln



Westinghouse turbine in power plant

Clear liquor overflow from each compartment is pumped to the white liquor storage tank, with a capacity of 13,000 cu. ft., and located in the evaporator room. This is the finished liquor which will be pumped intermittently to the digester measuring tank for cooking. The sludge from the bottom of the white liquor clarifier will be diluted with the clear overflow from the dregs washer, additional fresh hot water and filtrate from the Oliver mud filter, before being fed to the three-tray four-compartment Dorr lime mud washer, 18 ft. diameter by 20 ft. high.

The clear overflow from this washer is pumped to the weak liquor storage tank to be used continuously in the smelt or dissolving tank. The sludge from the bottom of the washer is pumped to the lime mud storage mixer tank, 15 ft. diameter by 15 ft. high, where it is diluted with additional hot wash water and the resulting slurry is pumped to a 6 ft. diameter by 4 ft. face Oliver vacuum type mud filter. The filtrate is returned to the Dorr lime mud washer, as noted above, and the thickened sludge is fed by screw conveyor to the feed end of the lime kiln. A Nash L-6 Hytor vacuum pump acting through a spray trap and vacuum receiver creates the necessary suction at the filter.

Lime Recovery

A Traylor Engineering 7 ft. diameter by 200 ft. long rotary kiln completes the causticizing equipment. The kiln is fired with Bunker "C" oil and the hot burnt lime drops out at the firing end to a water-jacketted conveyor for cooling before being elevated, and stored in the steel lime silo 16 ft. diameter by 22½ ft. high. From the bottom of the silo, the lime is conveyed at a continuous controlled rate by means of screw and bucket conveyors to the lime slaker. Three-quarter inch limestone is purchased and stored in two 750-ton storage silos and conveyed to the feed end of the lime kiln. This limestone may be fed at a steady rate along with the sludge, or calcined separately. The kiln is equipped with fully automatic combustion controls, an auxiliary gasoline engine drive, and a wet scrubber for recovering fines from the flue gases.

Process Water

Fresh process water is obtained from the North West Millstream, where a dam was constructed and a pump house filter plant located. The dam has a sluice gate and a high and low spillway.

Raw water is pumped to six 15 ft. by 15 ft. gravity sand filters in parallel, and the filtered water is stored in two clearwells directly below the filters. An additional pump is provided for backwashing the filters. A 2,500 gpm pump is provided for pumping the filtered water to the mill and an auxiliary 2,500 gpm gasoline engine driven pump is so located to pump either raw or filtered water direct to the mill. A 16 inch inside diameter wood stave line, 3,500 ft. in length, delivers water to the surge tank. The surge tank, located at the top of the hill, is of reinforced concrete construction, 10 ft. x 8 ft. x 100 ft., and provided with an overflow and piping to return the water to the pond. To the overflow level, the surge tank capacity is approximately 4,060 cu. ft. and the elevation at this point is approximately 165 ft. above the pump house floor. From the surge tank to the mill, there is a drop of 183 ft. and the water will flow by gravity through 19,300 ft. of 16-inch pipe. Of the 22,800 ft. of 16-inch pipe, only 900 ft. is cast iron.

Feed Water

Raw water, approximately 60 gpm, is required for steam generation. Sulphuric acid, alum and silica are fed continuously from make-up and storage tanks, located in the feed water building, to the raw water ahead of a decarbonator tank directly above the rapid reactor tank. Additional silica can be added direct to the rapid reactor. The rate of flow of raw water through the decarbonator is regulated by a mechanical float control in the rapid reactor tank.

From this tank, a booster pump delivers water to the top of four strainer type 3,600 gal/hr. pressure sand filters in parallel, ahead of three 7,500 gal/hr. Zeolite softeners in parallel. Weak caustic soda solution is introduced between the filters and softener tanks. Piping has been so arranged as to make possible the by-passing of the filters and softeners. From the softeners, the water is pumped through a heat exchanger, utilizing the heat in the continuous blow-down, and then to the deaerating heater, where mill condensate and low pressure flash steam are picked up. In parallel with the latter heater is a 2,000 cu. ft. storage tank with by-pass piping and mechanical float control to assure two hours supply of treated water for boilers at all times.

From the deaerating heater, the boiler feed drops by gravity to the boiler feed pumps, one of which is a 400 gpm Terry steam-driven turbine, and pumped through a closed heat exchanger to both auxiliary and recovery boilers. The closed heater utilizes 140 lb. psi steam, the flow of which is controlled by a temperature bulb in the feed water line to the boiler. Sodium metaphosphate for controlling scaling in the boiler is added directly to the boilers from the make-up tank.

Other related equipment not mentioned above is a small silica aging tank located on the floor above the silica measuring tank, and the mill condensate receiving tank. This latter tank is 5 ft. in diameter and 10 ft. in length. A mechanical float control regulates the flow to the deaerating heater. In addition, the tank is equipped with a 5-inch regulating overflow valve and a 3-inch relief valve.

Steam and Power

Power will be generated from high pressure steam by a 2,000 kw. Westinghouse condensing turbine and a 2,500 kw. Westinghouse extracting and exhausting turbine. Extracted steam at 140 lb. psi will be used at the digesters and a steam accumulator, with a capacity of 14,000 lb., is in parallel with the digester line to assure uniform operation of the turbine. Exhausted steam at 40 lb. psi from the same turbine and steam from the accumulator will be used as process and heating steam in the mill.

A 36-inch wood stave salt water intake pipe, 220 ft. long, runs out from the salt water pump house located at the river's edge into the stream to a point about 6 ft. from the nearest pier. At this point, the intake is about 6 ft. below low tide level. A Link-Belt vertical traveling water screen, model No. 45, with trays 7 ft. wide and a capacity of 15,000 gpm, located in the salt water pump house removes large particles. An L-shaped channel, 17 ft. deep, on two sides of the building acts as a head tank. Two Cameron 2,500 gpm, 290 ft. head pumps, driven by 250 hp. motors supply water to the fire mains. Two Cameron 3,500 gpm, 90 ft. head pumps, driven by 100 hp. motors supply salt water to the mill for condensing at turbine, turbine pump, evaporator, and clean-up purposes.

Laboratory

The laboratory is divided into two main sections—a dry or analytical laboratory for the preparation of mill testing solutions and the analysis of raw materials, water, and special testing, and a wet or pulp testing laboratory for the preparing and testing of pulp, chips, bark, etc. A chemicals storage room, clerical office, and charts room complete the laboratory. An instrument repair and storage room has been provided and this is adjacent to the laboratory.

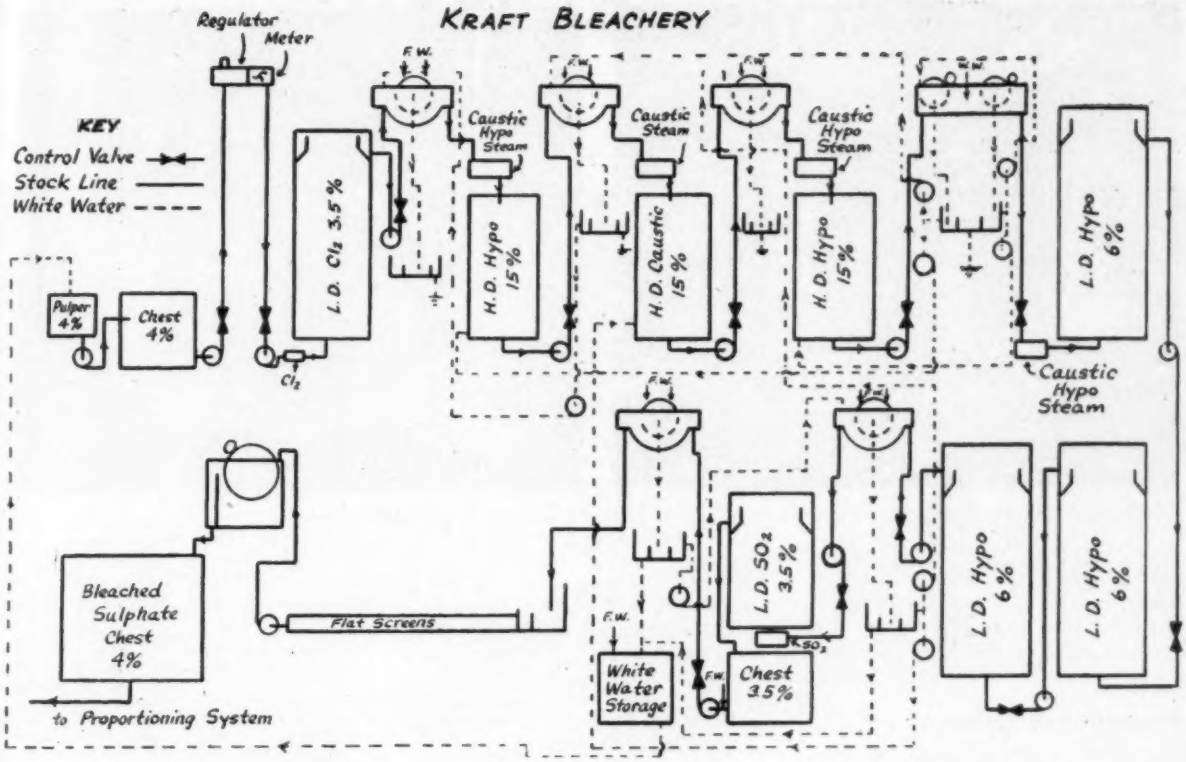
A well equipped machine shop with separate rooms for wood-working shop, electrical shop, and blacksmith and welding shop has been provided in a connecting building and adjacent to the mill stores.

The office building will house the clerical staff, as well as all woods department personnel and a first aid room. Below the office are located the employee locker room, shower, and wash rooms, as well as a file storage room. A lunch room has been located in the mill building.

Housing is provided for some members of the mill and woods operating staff. This consists of two units of two houses each, one unit of three houses, and one single house unit. In addition, a Staff House, with private quarters and sufficient rooms for eleven persons, has been built. All buildings are located near the mill in a semicircle with a common driveway at the front.

Principal Pulp Mill Equipment

Accumulators—Foster Wheeler Ltd.
Agitators—Sherbrooke Machineries Ltd.
Auxiliary Boilers—Combustion Engineering Corps. Ltd.
Bark Presses and Drainer—Hydraulic Machinery Co. Ltd.
Blow Heat Condenser—Whiting Corp. (Canada) Ltd.
Blow Tank—Dominion Bridge Co. Ltd.
Brick and Tile—Citadel Brick Ltd.
Building Construction—E. G. M. Cape and Co.
Causticizing System—Dorr Co. Inc.
Chip Feeders—Williams & Wilson Ltd.
Chip Screens—Thomas A. Dillon
Chipper—Carthage Machine Co.
Conveyors and Elevators—Jeffrey Manufacturing Co. Ltd., Link Belt Ltd., Stephens-Adamson Manufacturing Co. of Canada Ltd., and United Steel Corp. Ltd.
Digesters—Dominion Bridge Co. Ltd.
Electrical Installation—A. J. F. Montabone
Electrical Switching—Canadian Westinghouse Co. Ltd.
Equipment Installation—Foundation Maritime Ltd.
Evaporators—John Inglis Co. Ltd.
Feed Water Treatment—Canadian General Electrict Co. Ltd.
Flume and Wood Stave Piping—Pacific Coast Pipe Co. Ltd.
Heating and Ventilating—Engineering Installations Ltd., and Ross Engineering of Canada Ltd.
Instruments—Bailey Meter Co. Ltd., Bristol Co. of Canada Ltd., Fischer & Porter Co. Ltd., Leeds & Northrup Co., and Peacock Brothers Ltd. (Foxboro)
Insulation—Canadian Asbestos Co.
Kamyr Wet Machine—Paper Machinery Ltd.
Lime Kiln—The Canadian Traylor Engineering and Manufacturing Co. Ltd.
Passenger Elevators—Darling Brothers, Ltd.
Piping and Valves—Crane Ltd., Grinnell Co. of Canada Ltd., James Robertson Co. Ltd., T. McAvity & Sons Ltd., and R. F. Walsh Co. Ltd.
Precipitator—Precipitation Co. of Canada Ltd.
Pumps—Bingham Pump Co., Canadian Allis-Chalmers Ltd., Canadian Ingersoll-Rand Co. Ltd., Northern Foundry & Machine Co. Ltd., and Worthington Pump & Machinery Corp.
Recovery Furnace — Combustion Engineering Corp. Ltd.
Scales—Canadian Fairbanks-Morse Co. Ltd., and Toledo Scale Co.
Flat Screens—Hydro-Turbine Co. Ltd.
Stacks—Custodis Canadian Chimney Co. Ltd.
Tile Tanks—Canadian Stebbins Engineering and Manufacturing Co. Ltd.
Turbine Generators—Westingbouse Electric Corp.
Washers and Thickeners—E. Long Ltd., and Ross Engineering of Canada Ltd.



New Kraft Bleach Plant at Edmundston

▶▶▶ FOR BLEACHING sulphate pulp manufactured at its new mill at Newcastle (N.B.), Fraser Companies Ltd., has designed and built a modern and compact bleaching plant at Edmundston (N.B.)

This plant is designed for bleaching at a normal rate of 120 tons of unbleached fiber per day, carrying out the usual four functions: (1) chlorination, (2) extraction, (3) brightness development, and (4) brightness stabilization. The building is a steel frame structure having brick walls with an inside course of tile. The floors are all reinforced concrete lined with tile.

Unbleached kraft pulp is delivered to the bleachery by railroad from the Newcastle plant in 1800-lb. skids at approximately 55 per cent moisture. The pulp is fed by conveyor to two 1400-lb. capacity pulpers. It is pulped to a 4 per cent consistency and passes to a stock chest of 5.7 tons capacity. The raw stock is pumped from this chest to a consistency regulator on the top floor (the operating floor) of the bleachery building where it is adjusted to a 3.5 per cent consistency and is metered to the chlorination stage by a stock meter.

Bleaching

Chlorine is metered into the unbleached stock by means of a liquid chlorine rotameter and control valve, entering through a line-mixer at the base of the chlorinating tower. The chlorinating tower is tile-lined equipped with central agitator.

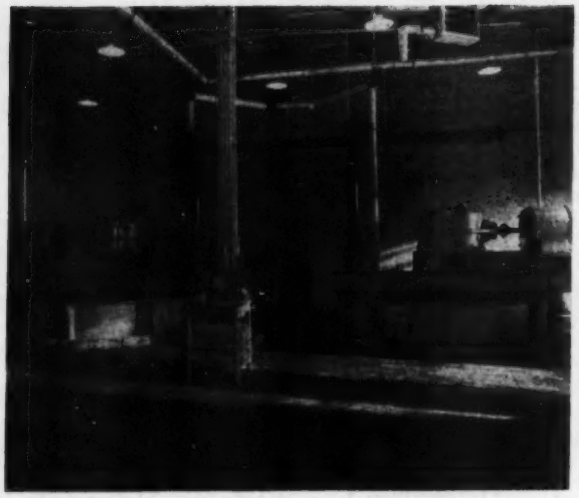
The stock then passes to the three high density stages. The three stages have almost identical equipment, each consisting of a tile-lined tower over which there is located a high density washer dropping stock at 15 per cent into the tower through a mixer. High pressure water nozzles at the base of each tower dilute the stock before pumping. In the first tower, hypochlorite and caustic are added at the mixer, in the second, caustic, and in the third, hypochlorite and caustic. Automatically-controlled steam is introduced at the mixers before each tower to keep the stock at the required temperature.

From the last high density tower (the second hypochlorite stage) the stock is pumped to a double cylinder decker-type washer and thickener where it is thickened to 6% consistency. To this thickened stock, controlled steam is added, and it is pumped through a line mixer, where hypochlorite and caustic are added, to the base of the first low density bleaching tower. There are three such towers, each tile-lined and equipped with central agitator. Stock pumped into the bottom, overflows out the top and is pumped into the base of the next tower. In each tower, hypochlorite and caustic may be added to bring the stock to the required brightness.

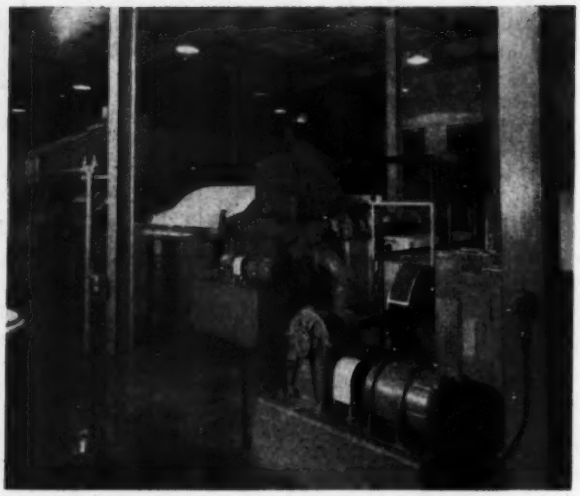
From the last low density tower, the stock is pumped to another washer, thickened to 3.5 per cent and pumped through a line mixer into the base of a small agitated reaction tower, where it is stabilized with SO_2 introduced in solution at the pump. The SO_2 addition is controlled by a *p*H controller. Stock overflowing from this tower is pumped to a sixth washer and then flows by gravity to the screens.

Screening

Smythe flat screens are used for the final screening. There are three lines of three sections for primary screening and a tailing line of two sections. Chrome plated plates of 0.008 inch and 0.007 inch cut are used. Accepted stock



Unbleached kraft from Newcastle is repulped in Valley pulpers



Sherbrooke washers and thickeners

from the screens is pumped to three deckers, thickened to 4.0 per cent and dropped into a storage chest of 12 to 15 tons capacity.

Proportioning System

Located beside the bleached sulphate storage chest just mentioned, is a bleached sulphite storage chest of the same size. The consistency of the stock from each chest is regulated to 3.5 per cent by separate consistency regulators before being pumped through a Ratosleeve and a ratio controller to this blending box. Similarly the bleached kraft is pumped through a Ratosleeve and a ratio controller to the same blending box.

From the blending box, bleached pulp in any ratio of sulphite to kraft may be delivered to the paper mill. There are also lines taken off before the blend box so that either of the unmixed stocks may be pumped separately to the board machine or the paper mill.

Instrumentation and Stock Flow Control

Most stock and water valves are Saunders type and are operated by Foxboro air cylinder positioners remotely controlled from a single console on the operating floor. Control buttons for most of the pump motors are located on the same console.

The plant is almost completely instrumented. Nearly all the instruments are mounted on a single panel beside the console on the operating floor. Temperatures in all tanks and towers are automatically controlled and recorded. Stock levels in the unbleached storage tanks, bleached storage chests, white water chests and high density towers are recorded. The *p*H is measured and recorded after each stage and the *p*H in the SO_2 reaction tower is controlled and recorded. All these instruments are located on the panel previously mentioned. A second panel on a lower floor records steam and water usage and effluent sewer flow going through a Parshall Flume.

Storage of Pulp

A pulp storage building having approximately 10,000 sq. ft. of floor space has been added. This is used for the incoming unbleached pulp. A covered train shed has been built to accommodate incoming pulp shipments. Car unloading is carried out by electric fork trucks.

Steam and Power

Low pressure steam is provided by the present steam plant. To increase the supply of power, a 3750 kv-a Westinghouse extracting, condensing turbine has been installed, of whose output approximately 1200 kv-a is used in operating the bleachery.

Corrosion Control

All chests, towers and washer vats have been tile lined. All pumps, agitators and mixers are rubber lined. Wherever possible, all metal frame work has been flame cleaned and protected with Valdura rubber base paint. All pipes are lithcoated or rubber lined.

Principal Bleach Plant Equipment

Consistency Control—Control Equipment Corp.
Construction—Foundation Maritime Ltd.
Electric Trucks—Elwell Parker Electric Co.
Electrical Equipment—Canadian Westinghouse Co. Ltd., Canadian General Electric Co. Ltd., and Reliance Electric and Engineering Co.
Electrical Installation—A. D. Rose Co.
Heating and Ventilating—Engineering Installations Ltd.
Instruments—Bristol, Bailey, Fischer & Porter, and Leeds & Northrup
Lithcoting—R. F. Walsh Co. Ltd.
Piping—Crane Ltd., Grinnell Co. of Canada Ltd., and James Robertson Co.
Pumps—Canada Pumps Ltd., Northern Foundry & Machine Co., and Canadian Allis-Chalmers Ltd.
Repulpers—Valley Iron Works
Rubber-lined Pipe and Fittings—Dominion Rubber Co., and B. F. Goodrich Rubber Co.
Screens—Hydro Turbine Co. Ltd.
Steel—Dominion Bridge Co.
Stock Flow Control and Remote Control Console—Foxboro Co., and Peacock Brothers
Thickeners, Agitators, Mixers, etc.—Sherbrooke Machineries Ltd.
Tile Linings—Stebbins Engineering & Mfg. Co.

Columbine Dev. Co. Gets First Award on Colorado Pulptimber

Preliminary award of the sale of four and one-half million cords of spruce pulptimber in Colorado was announced March 29 by the Forest Service of the Department of Agriculture.

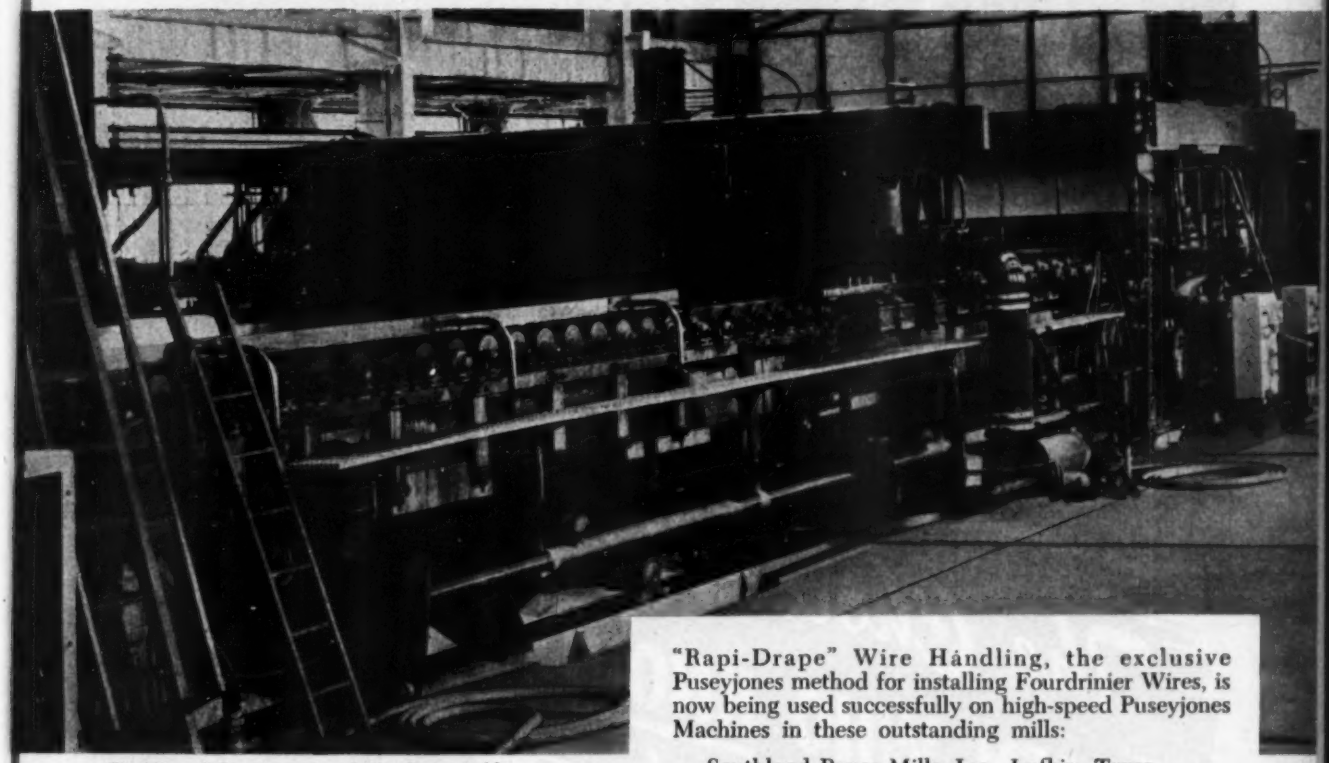
The award was given to the Columbine Development Co. of Grand Junction, Colo., following an oral auction, when that company made a bid of $3.10 per cord. The Cellulose Engineers, Inc., Seattle, Wash., was the only other qualified bidder.

Terms of the sale call for the establishment of a pulp plant with a minimum capacity of 200 tons daily to be built on the western slope of Colorado's Rocky Mountains. It will be the first plant of its kind in the state and will employ about 600 people.

The Columbine company, however, must still meet certain requirements. Before the final award, it must show evidence of working capital of $10,000 for plant construction activities.

Final award of the sale will be made on June 30, 1951.

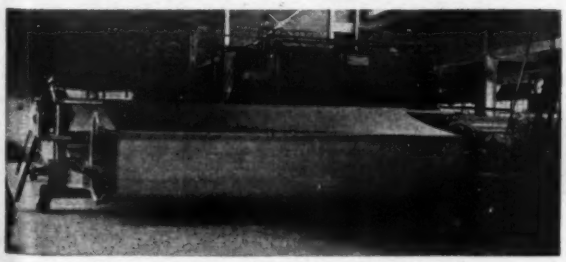
Success Story
ON "RAPI-DRAPE" WIRE HANDLING



"Rapi-Drape" Puseyjones Fourdrinier Part suitable for a wire 236" wide, 120 ft. long.

Wire holder handled by crane.

Under-carriage in position ready to drape wire.



Wire draped on under-carriage ready to install.

"Rapi-Drape" Wire Handling, the exclusive Puseyjones method for installing Fourdrinier Wires, is now being used successfully on high-speed Puseyjones Machines in these outstanding mills:

Southland Paper Mills, Inc., Lufkin, Texas
Hollingsworth & Whitney Company, Mobile, Ala.
Southern Advance Bag & Paper Co., Hodge, La.
St. Mary's Kraft Corp., St. Mary's, Ga.
Union Bag & Paper Corp., Savannah, Ga.
Hudson Pulp & Paper Co., Palatka, Florida
Southern Paper Board Corp., Port Wentworth, Ga.
Fibreboard Products, Inc., East Antioch, Cal.
St. Regis Paper Co., Tacoma, Wash.
Calcasieu Paper Co., Elizabeth, La.
San Rafael Paper Co., Mexico, D. F.
Papierfabrik Utzenstorf, Switzerland
National Newsprint Co., Ltd., India

The results in terms of fast, safe wire handling are acclaimed by the responsible operators and engineers. There are no heavy parts to handle. The Fourdrinier part remains in perfect alignment at all times, adequately supported at front and back. No danger of deflection stresses and distortion as experienced with complete removal or cantilever change.

Be sure that your next machine is equipped with "Rapi-Drape" Wire Handling – one of many design improvements and labor saving devices pioneered by Puseyjones.

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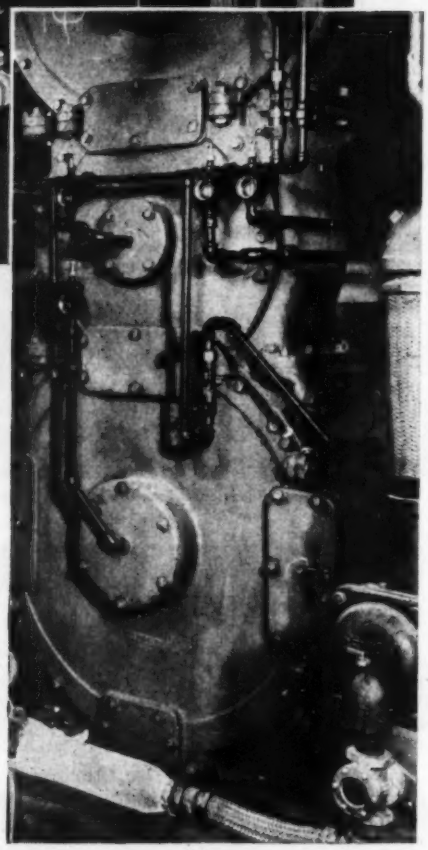

Bowser Lubricating Systems serve the new Coosa River Newsprint Company, Coosa Pines, Alabama.

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For high-speed production in paper mills a Bowser lubricating system is a must!

More than 40 years of experience in designing and building dependable lubricating systems are behind each Bowser paper mill oiling system.

If one of your problems is to increase the speed of old machines, a Bowser engineer will be glad to recommend the proper lubricating equipment for the bearings. Write to Bowser, Inc., 1315 Creighton Avenue, Fort Wayne 2, Indiana.

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Fig. 1—FIBREpulper

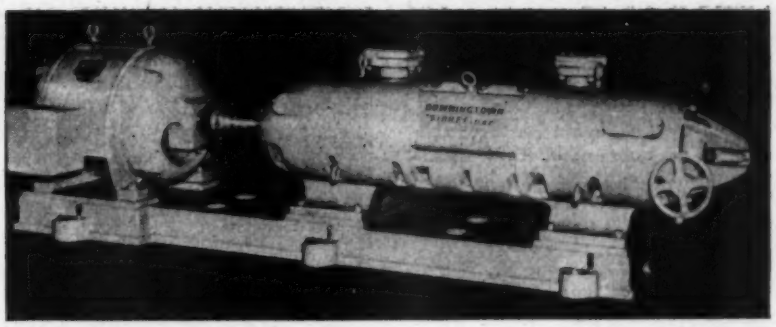

Fig. 2—FIBREfiner

Downingtown Announces New Stock Preparation Equipment

▸▸▸ RESULTING FROM an extensive development program carried on since the war, several new and improved types of stock preparation equipment have been announced by the Downingtown Manufacturing Co., Downingtown, Pa. The three types of units available are (1) a pulper for stock disintegration, (2) a broke pulper, and (3) a stock refiner based on the Wiener refiner.

FIBREpulper

The main characteristic of this stock disintegrating unit is the lobe shaped vertical tub as shown in Figure 1. This shape not only produces a good vortex but each lobe develops its own stream of stock feeding back to the impeller. This tub design aids in uniform mixing and rapid disintegration. Shape of the tub allows for the use of a large diameter impeller. Because of the rapid disintegration action, it is claimed by the manufacturer that a smaller unit for a given tonnage is required than with other types of pulpers.

First commercial installation of a FIBREpulper was made early this year in an eastern tissue mill. This batch unit was designed for disintegrating sulphite pulp in batches of 3,000 lb. It was equipped with perforated plates on the sides and bottom for dumping.

Two continuous type FIBREpulpers for mixed papers will be installed soon in another mill. These 8 ft. diameter units are designed to pulp 75 tons per twenty-four hours. They are equipped with continuous-type raggers and junk removers. Continuous extraction will be made through the perforated side walls.

A new centrifugal type grit remover has also been developed for use with the FIBREpulper.

Broke Pulper

The new Downingtown broke pulper incorporates rapid disintegration, low horsepower and minimum space requirements. A semicommercial unit has been built and is available at the manufacturer's plant for trial or inspection.

FIBREfiner

This newly redesigned machine shown in Figure 2 is based on the high speed Wiener refiner, patents for which were obtained by Downingtown in 1940. It may be used for hydrating in one or several passes with proper regulation of consistency, throughput rate and setting. It may be used for a wide variety of fibers including groundwood, sulphite, kraft and for disintegrating partially pulped papers of all types. Stocks being passed through the refiner between the plug and shell are subjected to an intense hydraulic disintegrating action due to the high speed of rotation. The refiner may also be used as a colloid mill for dispersing clays and pigments for coating and fillers.

Continental Paper Plant Has Resumed Operation

▸▸▸ AS THE RESULT of intervention by a local citizens committee, the plant of the Continental Paper Co., Ridgefield Park, N. J., has resumed operations. On March 28, maintenance men began to put the plant's machinery back in operating condition; production workers returned to work a few days later.

This announcement was given to the press immediately following a statement received from Continental president, William J. Alford, Jr., who is in England. Mr. Alford had announced on February 6 that he was closing the plant indefinitely and issued orders to dismantle machinery in preparation for a prolonged shutdown. This proposed termination of operations resulted from a long and much publicized strike which had been accompanied by violence.

In his statement authorizing reopening of the plant, Mr. Alford said, in part: "My decision to reopen the plant results from these two factors: (1) the assurance that the irresponsible union leaders who caused the strike have been removed from power; (2) the pressure which was brought to bear by the citizens' committee, newspapers, and employees who lost their jobs as the result of the shutdown.

"However, I want it distinctly understood that this is not the reopening of an old business, but in effect the birth of a new one. Whether the Continental Paper Co. is to continue in business or whether the wounds of a nine-months strike eventually may force us to close our doors forever now rests in the hands of those returning to work. Only by their willingness to work efficiently, and their desire to co-operate in the gigantic task of getting the company back into production on a profitable basis can this new venture succeed."

The outcome can be analyzed as follows:

Nearly 400 production workers have been out of work for eight months. The workers will return to work under the contract in force July 5, 1949, when the strike was called.

Anthony Adamo, a union leader, who was convicted of assaulting two

company officials, has agreed to resign his union office.

Ernest Fritz agreed to resign as president of the local union.

An administrator has been named to operate the union headquarters until an election can be held within three to six months.

After the election of new officials, negotiations for a new contract will be opened.

The strike attracted national attention because the Continental company was the first company in the paper industry to sign a contract with a labor union providing for a distribution to the workers of a portion of the company's profits. (Cf. P.I. and P.W. June, 1947, p. 784). It had been charged that the union went on strike to secure increases in wages to compensate for losses of this profit-sharing advantage when the company's profits fell off.

C-Z Plans River Contamination Control

In an effort to combat contamination of the Columbia River at its Portland, Ore., plant, Crown Zellerbach Corp. has made plans to extend its discharge pipe from the Camas paper mill across Lady Island to the main channel of the river, thereby spreading waste discharge over a much larger area than now is possible. Application has been made to the Portland district engineering corps for permission to lay a 20 or 36 inch pipe under the Camas slough and into the Columbia.

If approved, the pipe will be placed in a ditch 5 feet below the slough bed, and below the main river bed to a deep hole about 50 feet below the surface. Eleven eight-inch riser pipes 45 feet below the surface at low water will discharge plant waste.

Discharge would be made about 800 feet downstream from power lines crossing the river near the upper end of Lady Island, and about 550 feet into the river from the low water line.

Crown Zellerbach officials have said that this plan can be considered only a temporary solution to the waste problem at the mill which presently employs about 2400 persons. The corps of engineers will pass only any objections to navigation which were filed before Mar. 29.

No. 3 Machine at Mando Back in Production

After a five-week shutdown in which the unit was completely modernized, the No. 3 Insulite machine at the International Falls, Minn., plant of Minnesota and Ontario Paper Co., Minneapolis, is back in production.

The rebuilt machine, assigned to the manufacture of half-inch coating stock, is expected to substantially increase the firm's production capacity of stock.

Accomplished by Mando mechanical and maintenance crews, the work included renewal of all drive chains in the kiln, realignment, and installation of a three-unit circulation system for drying the Insulite products more quickly and uniformly, on the dry end; wet end improvements were a new drive for the forming machine, an improved headbox with agitator, and agitating equipment for the machine chest.

A DISPLAY OF PRODUCTS was shown to more than 75 stockholders of Kalamazoo Vegetable Parchment Co., when they attended the company's annual meeting. Merle Wood, waxed paper sales manager, is shown explaining a portion of the display to Mr. and Mrs. W. F. McMichael, Kalamazoo stockholders, while Allan B. Milham, KVP stockholder and former president of Bryant Paper Co. (now the Bryant Div. of St. Regis Paper Co.), looks over the exhibits

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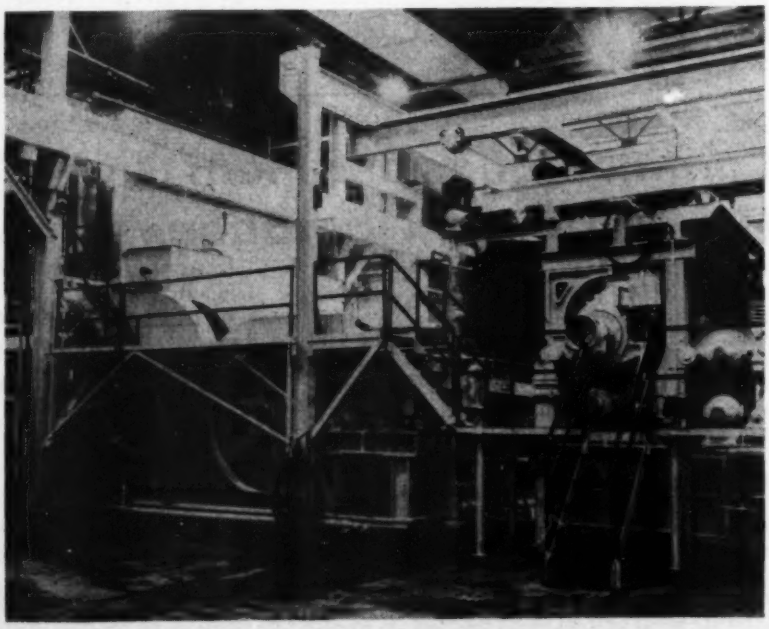
DAMAGE ESTIMATED AT $50,000 was caused by a fire at the Canadian International Paper Co. plant at Gatineau, P.Q., February 6. Reported to have started in a storeroom, the blaze caused an eight-hour shutdown.



Wet end of newly rebuilt No. 3 Insulite machine, Minnesota and Ontario Paper Co., International Falls, Minn.

...all these clean, white fibres, processed and ready to be made into *pay* paper. Bird Save-Alls are recovering them at lowest possible cost per pound.

These fibres have gone through a lot of expensive preparation.

You wouldn't want them to go to waste in *your* mill, would you?

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Research Project on Spent Sulphite Liquor and Torula Yeast Planned at U. of Wyoming

▶▶▶ A RESEARCH PROJECT enlisting university scientists in the problems of reducing stream pollution was announced recently by the Sulphite Pulp Manufacturers' Research League. Four similar projects have been undertaken in recent months.

A cash grant has been made by Hoberg Paper Mills, Green Bay, Wis., to the National Resources Research Institute at the University of Wyoming to establish a research fellowship. Under the grant, the university will study the possible commercial use of spent sulphite liquor and of torula yeast plant effluent as binders for making fuel briquets from coal dust. It is also hoped that the research done will yield results which will be of value in iron ore briquetting and road surface binding. Any results attained will be made available to all members of the League.

Developments of past weeks indicate that several Wisconsin sulphite pulp manufacturers may build torula yeast plants for processing spent surphite liquor within the near future. The torula yeast process, which reduces the oxygen-consuming characteristics of the treated liquor, lessens the harmful effects of the liquor upon aquatic life in streams receiving waste liquor.

Certain compounds present in the spent liquor can be processed with yeast, leaving the remaining liquor for disposal. With commercial scale yeast plants in the offing, disposal of yeast-process effluent becomes a problem, since tests made by the Green Bay Metropolitan Sewerage District show that the effluent does not respond satisfactorily to conventional sewage treatment processing.

Preliminary work being done with the yeast-process effluent at the Rhinelander, Wis., experimental plant (cf. P.I., March, 1950) shows that it may be useful as a binder; the University of Wyoming will also study this phase of the problem.

Spent sulphite liquor is now used in several Wisconsin areas to provide a gravel road topping similar to, but much less expensive than, black top. The liquor is supplied to county and township road officials without charge, in any amount needed.

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THE SULPHITE MILL of Port Huron Sulphite and Paper Co., Port Huron, Mich., was shut down permanently in February. The 60 year old pulp mill was considered obsolete and its closing had been planned for some time. The company will now purchase its pulp requirements, considering that method more economical since pulp supplies are more plentiful.

NOW CERTIFIED BY the Certified Pulp Testers Bureau are The Paper and Pulp Testing Laboratories, 118 East 28th St., New York. The laboratory is under the direction of William Landes, a graduate of the N.Y. State College of Forestry of Syracuse University.

A WESTERN SALES OFFICE, to be located in the Daily News Building, Chicago, has been opened by Gilman Paper Co., New York. Earnest A. Kendler, associated with the firm for the past 25 years, has been named manager of the new offices.

Import Cases

A group of cases involving some thirty importations of Austrian newsprint have been tried before the United States Customs Court. All of the shipments were paper for small dailies, but were classified for duty as groundwood printing paper because the ash content was in most cases from 10 to 15 per cent, according to Warren B. Bullock, Manager of the Import Committee of the American Paper Industry. The importers claimed that the paper was standard newsprint duty free. Several well known domestic paper manufacturers testified in support of the classification of this paper duty.

A test case involving the dutiability of imported paper table napkins, serviettes and cocktail napkins was also tried in United States Customs Court. The merchandise was classified for duty at 35 per cent as manufactures of paper, but was claimed to be dutiable at 15 per cent as paper cut into shapes. Meanwhile, a group of new cases was added to the already long list of protested importations on file. New cases included one shipment from Denmark and fifteen from England.

The United States Customs Court has overruled the protest of a Philadelphia importer of kraft wrapping paper that the Customs officials erred in measuring the weight of the imported paper. The importer was required to pay duty as assessed by the Customs examiner.

Four shipments of handmade drawing paper, three from England, and by the importers, one from France, classified for duty at 7½ per cent and 1½ cents per pound are claimed to be dutiable as drawing paper at 5 per cent and 1 cent per pound.

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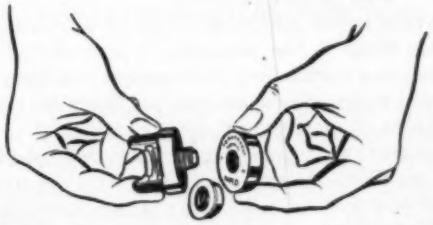

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Fig. 123 is an exceptionally rugged valve . . . available with various types of discs especially compounded to give top results on the services for which they are recommended. Discs can be renewed or interchanged quick as a wink, insuring long-time satisfactory valve service with negligible maintenance expense. Disc holder is slip-on type, perfectly guided. Hexagon head gland is an aid to easy repacking. A further economy feature is the distinctive, long-wearing stem material developed by Lunkenheimer, eliminating stem-thread failure due to wear.

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Paper and Paperboard Making—II

HARRY WILLIAMSON

This is the second of a series of articles by Mr. Williamson. The first installment, Hydration—Part I, appeared in the March issue. These articles (from the author's book to be published by Fritz Publications, Inc.) will appear in THE PAPER INDUSTRY regularly.

Hydration—Part 2

HYDRATION is that condition of the fibers developed by beating them in the presence of water which, on drying, exerts a contracting and compacting force. As the water of hydration evaporates, the fibers are pulled and held into an increasingly dense continuity.

The greater the degree of hydration developed by BEATING the fibers, the greater the DENSITY, the greater the SOLID CONTENT and the more HOMOGENEOUS the surface of the sheet of paper made.

Where such density and solid content is not wanted, and continuity of surface is a necessity, then such surface is obtained by the use of loading materials to fill in the voids between the non-contracting undeveloped fibers.

All other operations in the making of a sheet of paper are interdependent on and affected by the degree of hydration developed by beating the fibers in the presence of water. These include formation, drainage of water through the wire mesh, application of atmospheric pressure by the use of vacuum, degree of pressure per individual press and total pressure applied by all presses, the rate of evaporation of moisture from the sheet by the dryers, and the continuity of surface as measured by the refraction of light and described as finish.

The control of the degree of development required for any given sheet is the most important factor in obtaining an even rate of production of equal values in quality.

The invention of the wet end gave us a mechanical means to form a continuous sheet thereby increasing production by relatively tremendous strides. The invention of the Holland-type beater to perform the multiple functions of changing rags to beaten stock ready for formation on the new wet end kept pace with the demands of continuous sheet papermaking.

In our modern era, the third radical change in papermaking has taken place: namely, predominant use of fibers of the seed hair family group with their natural characteristics and high natural alpha content has given way to the predominant use of fibers of the wood family group with their natural characteristics and low alpha content.

During this change of raw material usage we have become acutely conscious of the wide difference in the amount of beating force necessary in the preparation of these two major fiber groups for papermaking.

As we have expanded the use of wood fibers we also have realized the difference of beating force required between species of the same wood family group. Meeting the new gigantic production demands of the past 30 years we have devised various me-

The words hydration, freeness, slow stock, long stock, short stock, are the most abused and loosely interpreted words in the nomenclature of the papermaking industry. This statement applies in varying degree to the manufacture and sales of paper, and the designing, building, and selling of stock preparation and papermaking machinery directly concerned with the formation and drying of paper. (From Hydration . . . Part I)

chanical means to develop these wood fibers with brackets of inefficiency not too noticeable because of the price range of increasing demand. We have described this desired condition of development as hydration, knowing full well that this all embracing name did not actually convey anything except that the fiber must receive this beating force in the presence of water.

The Original Papermaker

Because he only used fibers of the seed hair family, and because the hand-applied beating force available was so *relatively small*, the beating time was protracted. Difference of an hour or two in beating time could make little difference in the effective work done on the seed hair family fibers. Because of the *high alpha content* of this type of fiber, it was, *and still is*, extremely difficult to develop this condition which we now describe as HYDRATION.

In simple language, it was almost impossible for the original papermaker to *beat his stock too slow*. With the primitive tools available, he was probably tired before he even reduced the fibers by splitting and transverse breaking. He was not bothered with the DEGREE OF HYDRATION. The hydration he created was very probably *only incidental* to his REDUCTION of the fibers to a particle size small enough to give him the required FORMATION. He was not concerned with all the numerous modern tests such as mullen, tear, tensile, fold and density. We brought those upon ourselves by our use of fibers from the wood family group and our necessity to make paper with developed values sufficient to meet the requirements of modern printing and converting machinery.

To the original papermaker, hydration was *incidental* to reducing particle size to obtain close formation. The FORMATION of the fibers into individual sheets was a manual TIME MOTION operation readily changeable in motion or time at the will of the operator.

Although the original papermaker worked very hard for small production, he did have more leeway for correction of beating errors by changing his TIME RATE of formation. His DEGREE of HYDRATION unit of measure was much *wider in latitude* than that available to the modern papermaker with his use of fibers from the wood family group and with his formation time rate measured in fractions of seconds.

Now that we have outlined some of the facts regarding hydration (which is so very important in modern papermaking), we might indulge in some speculative searching for CAUSE and EFFECT.

We know the raw materials used; now what, in general, were the BEATING TOOLS used for the first thousand years of papermaking? According to history, the pestle and mortar, and flat sticks with rounded edges were the tools used for beating.

What started papermaking? Surely it is beyond the bounds of probability that the original papermaker woke up one fine morning, and, apropos of nothing at all, said "this morning I will make a sheet of paper." In all the history of human endeavor translated into actual accomplished fact we find the looming necessity of the moment approached through the medium of comparable experience of the past. For hundreds of years before he made paper, man made cloth. Quoting from the *Encyclopaedia Brittanica* (Vol. 21, Eleventh Ed.):

"the demands made by prehistoric man for fabrics designed for clothing and shelter were few and simple, and these were fashioned by interlacing strips of fibrous material and grasses, which, in their natural state were long enough for the purpose in hand. But as he passed from a state of savagery into a civilized being, his needs developed with his culture, and those needs are still extending."

For hundreds of years before he made paper, man made sheets of papyrus on which to record his writings. In our speculative search for the interpretation of the beating effect (which we call hydration), the method of making papyrus is of more importance than the actual use of papri, the plant life from which the papyrus was made.

The use of this plant life fiber was a step in the direction of the eventual use of the seed hair family fibers. PAPYRI are plant life of the SEDGE FAMILY group; they grow tall and have a smooth triangular stem. (In our modern life we are familiar with the sedge family group because we are familiar with sedge birds, sedge hens, and the fisherman's sedge flies; all of which derive their name from making their habitat in this tall grass-like plant of the sedge family.)

Papyrus

Papyrus was made by CUTTING papyri into longitudinal strips; ARRANGING these strips crosswise; BUILDING up two or three alternate layers; SOAKING the built-up layers in water, and PRESSING the whole into a homogeneous flat surface.

Our ancient ancestor used the immediate raw material to his purpose and cut it into strips; he formed these strips, then, using water and pressure, made himself a sheet with a more even and continuous surface than he could have made by interlacing strips of material together. He felted the strips together by the use of pressure in the presence of water. Here there was, as yet, no question of reducing by beating, no question of rubbing or striking blows with sticks. This was felting into a homogeneous whole by pressure with the softening aid of water. To this day, we modern papermakers speak of felting the sheet and use woven endless woolen blankets or felts to carry the still wet sheet through the presence so that pressure may be applied.

The Encyclopaedia says this about felting: "Felting consists in bringing masses of loose fibers, such as wool and hair under the combined influences of heat, moisture and friction when they become firmly interlocked in every direction."

The work of the dandy roll on the modern paper machine is felting by bringing the finer fibers to the surface of the sheet on which the printing will be done. The work of the press rolls is felting simultaneously with the removal of liquid water from the sheet.

However, our ancient ancestor was chiefly concerned with making a more continuous surface on which to write just as we in modern papermaking have evolved the coated sheet on which to print the

beautiful four-color advertisements. He was after a more even formation, and, in his primitive manner, he got it without beating, but *he did use water as a softening agent.*

Alternate layers of strips laid in position by hand—no interlacing or weaving, edge to edge to form a layer, each layer placed crosswise to the one underneath—was the hand-formed position of the raw material. The only stock preparation function before formation was the cutting into long narrow strips. *No beating in the presence of water and, therefore, no hydration.*

This built-up layer form of fiber strips was then soaked in water until the voids between the fibrous matter of these grass-like plant strips, the voids between the edges of the laid strips, and (most important to his purpose) the voids in the individual fibers of which the strips were composed were filled with water. Then, to this thoroughly soaked, softened, semi-flexible mass form he applied pressure and achieved a more continuous sheet surface on which to write without interlacing or weaving.

Suppose we skip 2500 years to make a direct comparison. One of the widely-used papers in our modern way of life is GLASSINE; a light weight sheet of paper with a high degree of transparency used for small bags and decorative wrapper. The primary selling value of this sheet is the transparency to display the contents of the bag or the printed advertising decorations of the package. The sheet is made sufficiently transparent for us to see through without distortion.

Glassine

Transparency may be described as *continuity of mass, offering no interference to the passage of light.* The polished glass of the car windshield as compared to the dirty, dusty glass—the far-flung penetration of the car headlights on a clear, bright night as compared to the dispersion of the light beam on a damp, misty night. The polished glass is transparent, light passes through it as a continuous beam without interference of fragments of solid dirt matter. The still night air is transparent, no dust raised by flurries of wind, no molecules of water mist to refract and disperse the beam of light.

Glassine paper is made from well beaten sulphite stock on a fourdrinier type paper machine. When this sheet leaves the paper machine it is a strong well formed sheet of paper with no more transparency than any other paper made under similar conditions. Then follows the converting process to create the transparency from which the sheet derives the name glassine.

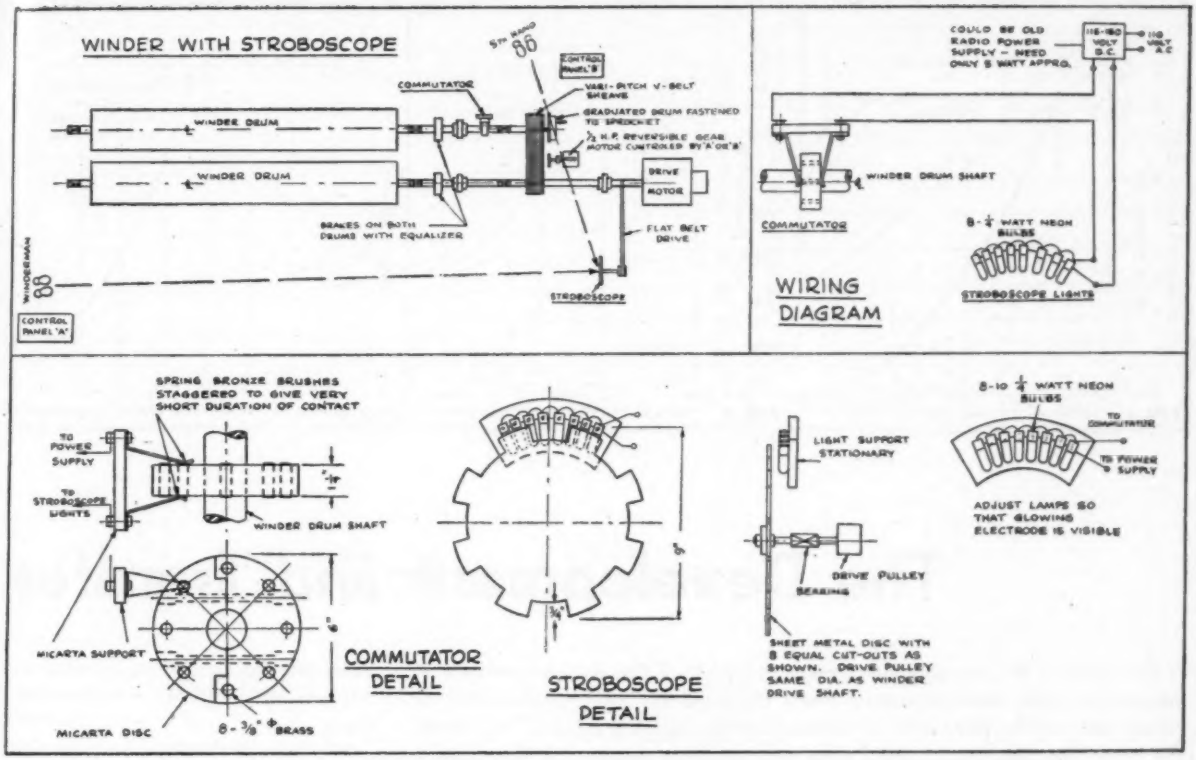
Grey steam, or steam which will readily condense into water, is showered on both sides of the paper; the voids between the fibers of the formed sheet are filled with water from the condensed steam. This moistened sheet is then passed through the rolls of the supercalender stack, and, as it enters the first nip, more steam is applied. The total weight of the revolving rolls plus the very great leverage weight applied to the rolls presses this condensate into the voids between the fibers and the voids of the individual fibers making a nearly continuous mass. The physical structure of the fibers is crushed out of all semblance of the natural shape and, as all fiber is naturally TRANSLUCENT, as the multiple facets of the individual fibers are crushed into a continuous combined mass with the water filled areas which were originally voids, continuity of mass and therefore TRANSPARENCY is achieved.

Papyrus, the immediate predecessor of paper, was made by SOAKING layered strips of fibrous matter in water and applying pressure. Because the pressure applied, in proportion to the thickness of the superimposed layers, was relatively light, our ancient papermaker achieved homogeneity of *mass* with continuity of surface. Conversely, because the pressure applied, in proportion to the thin, lightweight, single layer of paper in conversion to glassine is extremely high, our modern papermaker achieves, by actual crushing, nearly continuity of mass in addition to continuity of surface and therefore obtains transparency of the sheet which we call glassine.

Water Added Without Hydration

In both instances, water was PRESSED or CRUSHED into the voids of the fibers. It was NOT GRADUALLY BEATEN INTO—it was NOT RUBBED INTO—it was NOT BRUSHED INTO the voids of the fibers. Such water *is* a component of the finished sheet, but it *is not* WATER OF HYDRATION or HYDRATION itself. There is no compacting, contracting force exerted as such water evaporates. There is no pulling of the fibers together thus reducing the amount of void area between the fibers. There is no increased strength values developed from the inherent values of the fibers by the use of water in this manner; in fact, most of the physical strength values developed in the beating and forming of the original sheet are lost by the physical crushing of the fibers by the supercalendar rolls. The converting of the sheet of paper into a sheet of glassine destroys nearly all the tear values, reduces the mullen and fold, and, as compensation for these losses, the density is INCREASED—and transparency is ACHIEVED.

In a subsequent chapter the reader will learn of our modern experiments to find out whether filling the natural voids in fibrous matter with water by pressure and WITHOUT a BEATING ACTION could possibly develop the inherent strength values of the fibers as demanded in the various grades of papers made today. He will learn that such imbibition or saturation of fibers does not develop the strength values. He will learn that we must still BEAT the fibers with some form of mechanical device in order to develop this CONDITION of the fibers which we loosely describe as HYDRATION. The imbibition of fibers with water and the hydration of fibers by beating them in the presence of water produce the same appearance of the sheet during the process of formation. Saturated fibers and hydrated fibers both part with their formation water slowly on the paper machine forming wire and both are commonly and loosely described as SLOW STOCK because of this characteristic common to both. However, there is a wide difference in the strength values of the one sheet compared to the other. These important differences will be dealt with in detail in their proper sequence; for the moment we accept the fact that the difference, with all of its implications, exists.



Stroboscope Aids Winder Operation

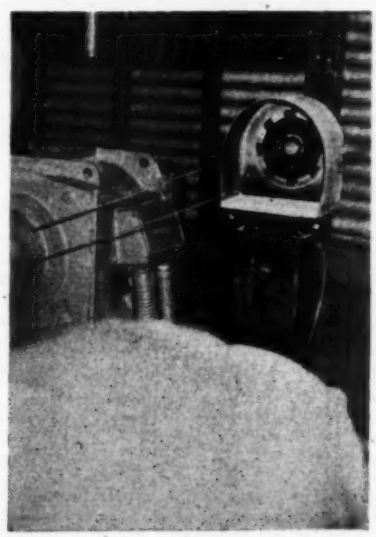
M. A. CHATWIN
Powell River Co., Ltd.

▶▶▶ THE INSTALLATION of the new newsprint machine at Powell River has made it possible to have the winder ready for operation in advance of the paper machine startup. Reels from a sister machine, with the same trim, could be used to gain experience in operating the winder and thus get the "bugs" ironed out which would ease the strain during the actual machine startup.

The new winder had the drums driven by vari-pitch V-belts. In trial operation it was found that the speed of the winder drums could vary over such a range that snap-offs were prevalent. Since the speed relationship between the winder drums must be exact in order to get tight starts and at the same time not have the sheet snap off, it readily can be seen that very minor changes in the pitch line of the belt could cause a speed differential that would cause snap-offs.

The other winders in the mill were driven by flat belts with cone pulleys and the operators were able to judge the speed relationship by the stroboscopic effect of the pulley spokes. However, with the vari-pitch V-belt drive there was no visible method of adjusting the speed relationship. Because of this difficulty the stroboscope device here described was developed and installed.

The stroboscope disc itself has eight equally spaced cutouts and is driven from the constant speed drum shaft by a flat belt on equal size pulleys. Behind the disc, stationary lights are mounted and spaced so as to show through at least one of the disc cutouts at all times. A commutator, having eight equally-spaced brass contacts, is fastened on the shaft of the stretch drum. As these contacts are engaged by a pair of brushes the lights go on. When the two drums are rotating at the same speed, the disc appears stationary against the lights. If one drum rotates slower or faster than the other, the disc appears to revolve to the right or the left, depending on which drum is rotating faster. An old radio power pack supplies power for the device. To enable the operator to return the vari-pitch sheave to its original position, a graduated drum was fastened to its drive sprocket.



The device is still in operation, and it is felt that this type of winder drive could not be operated without such a precise method of measuring the speed differential between the winder drums.

Credit for developing this application is shared by the author with R. M. Black, general maintenance superintendent, and the Applied Science Division of Powell River Co., Ltd.

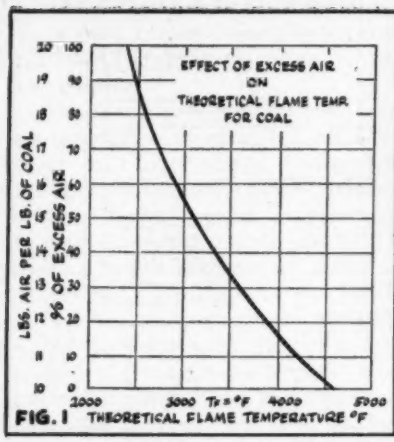


FIG. 1 THEORETICAL FLAME TEMPERATURE °F

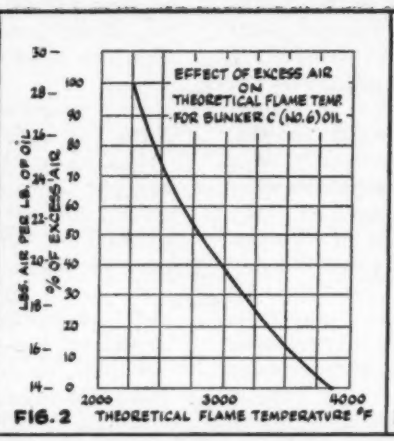


FIG. 2 THEORETICAL FLAME TEMPERATURE °F

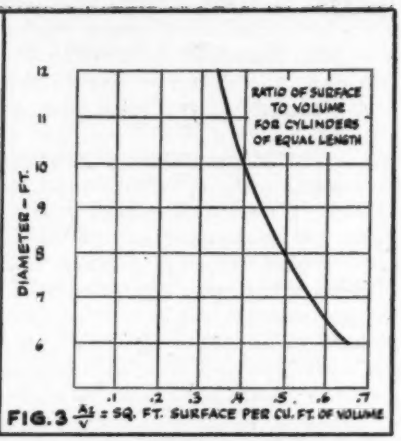


FIG. 3 $\frac{A_s}{V}$ = SQ. FT. SURFACE PER CU. FT. OF VOLUME

The Development and Transfer

In December, 1949, we published an article by Mr. Gibbs on fundamentals of lime-recovery-kiln thermodynamics which discussed the heat requirements of rotary kilns and the disposition of heat during the calcining process. This month the author discusses heat transfer rates and compares the costs of firing rotary kilns with different fuels.

RALPH GIBBS
Consulting Chemical Engineer

▶▶▶ IN THE NORMALLY operated rotary kiln, the factors limiting the development and transfer of heat are (a), the pressure drop through the kiln, and (b), the physical dimensions of the kiln.

The pressure drop through the kiln is measured usually by the draft at the end where the gases leave the kiln. It is more desirable to use the term "pressure" drop rather than draft, however, since it is not inconceivable that the time may come when the gases will be forced through the kiln by a positive pressure above atmospheric. At the present time the common practice is to have the pressure of the atmosphere force the gases through the kiln by the creation of a sub-atmospheric pressure at the exit-gas end of the kiln by means of natural draft or mechanical exhausters. In any event, the pressure drop through the kiln is one of the factors limiting the rate at which the fuel can be burned properly.

Combustion

Ordinarily, the heat is developed by the combustion of some primary fuel such as coal, oil, or gas. On the basis of the cost of the heat units delivered to the kiln, coal usually is the cheapest and, therefore, is used generally. With coal at $5.00/ton delivered to the kiln, the cost of 1,000,000 Btu is about 18 cents. With bunker C oil delivered to the kiln at 9¢/gal, the cost of 1,000,000 Btu is about 60 cents. Under certain conditions, there may be some advantage in using the fuel of higher cost. The fear of contaminating the charge with the fuel-ash has been the deciding factor, in many instances, favoring oil. On the other hand, when the coal is prepared properly, and when the velocities of the gases through the kiln are adequate, the contamination by ash is not at all serious.

In order to make this study apply as broadly as possible to paper mill lime recovery, the two fuels will be discussed separately so that their differences in the results of their applications will be shown. Because of the different chemical and thermodynamic nature of the different fuels, the derivations when postulating one fuel cannot always be used directly with another.

Table 1

Pounds Air per lb. Coal	Per cent Excess Air	W_g	T_F Deg. F.
10	0	10.96	4560
11	10	11.96	4180
12	20	12.96	3860
13	30	13.96	3590
14	40	14.96	3340
15	50	15.96	3130
16	60	16.96	2950
17	70	17.96	2790
18	80	18.96	2640
19	90	19.96	2510
20	100	20.96	2390

Coal

When we speak of coal in connection with rotary kiln operations, a good grade of bituminous coal is implied. Such coal will have an ash content of about 6 per cent, and a heating value of about 13,500 Btu/lb.

Although a great deal has been said and written on the importance economically of carrying on the combustion process at its highest possible efficiency, it can do no harm to repeat something of what has gone before. When coal is burned without sufficient air, the full heating value is not released directly. Under these conditions only a portion of the heat is directly available, while the remainder exists only as potential heat. Each pound of carbon burned to carbon dioxide develops 14,093 Btu, while each pound of carbon burned to carbon monoxide develops only 3,843 Btu. In the second instance, 10,250 Btu remain as potential heat in the carbon monoxide. Thus only 27.2 per cent of the original heat potential of the carbon is realized when it is burned to carbon monoxide instead of to carbon dioxide.

On the other hand, a great excess of air is to be avoided also, since this causes the heat to be developed at a lower temperature level, the gas velocities in the furnace or kiln must be greater to burn the same quantity of fuel, and the heat carried to waste by the gases will be increased, all other conditions remaining the same.

As an illustration of how excess air effects the theoretical flame temperature, the following computations, Table 1, and Figure 1 are presented.

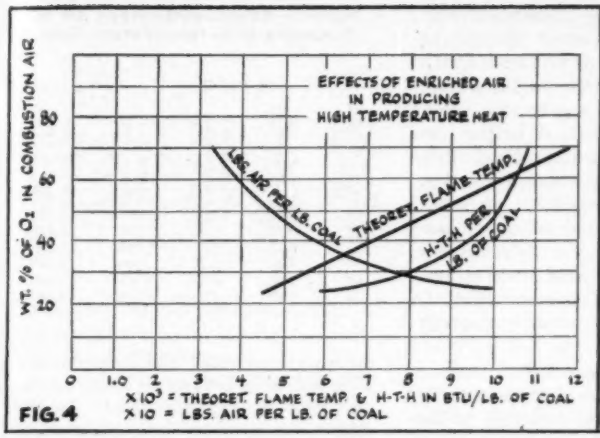

EFFECTS OF ENRICHED AIR IN PRODUCING HIGH TEMPERATURE HEAT
WT. % OF O2 IN COMBUSTION AIR
LBS. AIR PER LB. COAL
THEORET. FLAME TEMP.
H-T-H PER LB. OF COAL
X10³ = THEORET. FLAME TEMP. & H-T-H IN BTU/LB. OF COAL
X10 = LBS. AIR PER LB. OF COAL

FIG. 4

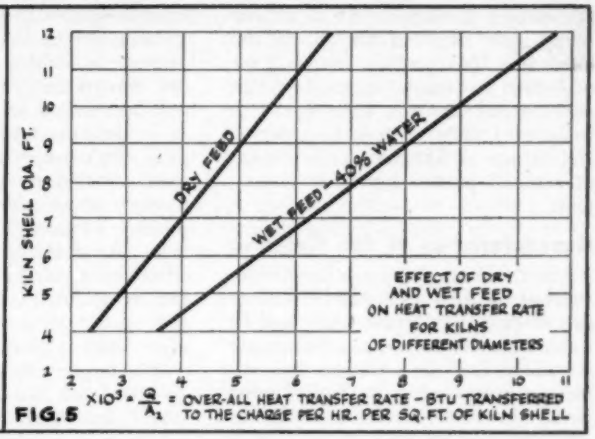

KILN SHELL DIA. FT.
DRY FEED
WET FEED - 40% WATER
EFFECT OF DRY AND WET FEED ON HEAT TRANSFER RATE FOR KILNS OF DIFFERENT DIAMETERS
X10³ = Q/A1 = OVER-ALL HEAT TRANSFER RATE - BTU TRANSFERRED TO THE CHARGE PER HR. PER SQ. FT. OF KILN SHELL

FIG. 5

# of Heat in Rotary Kilns

The theoretical flame temperature is computed by means of the following relation:

$$T_F = \frac{H_c}{W_g \times \text{Sp. Ht.}}$$

wherein:

T_F is the theoretical flame temperature, deg. F.

H_c is the heat of combustion of the fuel. Coal 13,500 Btu/lb.

W_g is the weight of combustion products/lb. fuel.

Sp. Ht. is the specific heat of the gases of combustion, about .27 at the temperatures involved.

The weight of combustion products depends upon the air-fuel ratio. For the coal postulated, the optimum ratio for balanced combustion is about 10 pounds of air per pound of coal. Each pound of coal carries with it about 6 per cent of ash, so that 94 per cent will be converted largely into gas. Thus, for the optimum ratio:

$$W_g = .96 + 10 = 10.96$$

Then:

$$T_F = \frac{13{,}500}{10.96 \times .27} = 4{,}560 \text{ F.}$$

When the air-fuel ratio is 11, then:

$$T_F = \frac{13{,}500}{11.96 \times .27} = 4{,}180 \text{ F.}$$

Table 1 shows the effects of excess air in steps of 10 per cent to 100 per cent above theoretical for complete combustion (Figure 1).

There are those who may not approve the use of these theoretical flame temperatures in the computations subsequently applying them. On the other hand, although such temperatures are not actually attained, due to the immediate radiation of heat and the dissociation of some of the gases at these high temperatures, we are interested primarily only in the equivalent heat involved, and for this purpose the use of these flame temperatures is valid—and most convenient.

In any event, to get the most economical results from the combustion process insofar as heat development is concerned, the combustion must be carried out at its highest possible thermal efficiency. With insufficient air, the full heating value isn't realized. With excessive air, the full heating value is developed, but at a lower temperature level. It will be recalled that in burning lime, the temperature level is of some importance commercially.

The use of enriched air recently has the interest of the steel manufacturers. By adding oxygen to the air for combustion, that industry has been enabled to finish their heats in a shorter period of time and do this at a higher thermal efficiency. This application to the rotary lime kiln awaits further analysis and investigation.

Table 2—Bunker C (No. 6) Oil

Pounds Air per lb. oil	Per cent Excess Air	W_g	T_F Deg. F.
14.25	0	15.25	3820
15.60	10	16.60	3590
17.05	20	18.05	3360
18.45	30	19.45	3160
19.85	40	20.85	3000
21.30	50	22.30	2840
22.70	60	23.70	2700
24.15	70	25.15	2570
25.55	80	26.55	2460
27.00	90	28.00	2360
28.40	100	29.40	2260

Oil

All that has been said for coal can be said for oil also. The principles remain identical, although the different nature of oil as a fuel will result in different values for the theoretical flame temperatures and for the weight of the gases. Table 2 shows the relations as given above for coal (Figure 2).

The combustion process is continuous. This means that there is a constant flow of air and fuel into the zone of action. Also, there must be a constant flow correspondingly away from the zone of action. The rate of this movement is extremely important. This rate of flow has an effect on the rate at which the fuel can be supplied and burned efficiently, and it also affects the rate at which the flowing gases give up their heat to the material being processed in the kiln.

In most cases, the combustion process is a volume phenomenon, with heat transfer largely a surface phenomenon. In the rotary kiln, then, the object is to provide adequate volume and surface for processing the material at the desired rate. Furthermore, the volume and surface must be properly proportioned. It is possible to provide ample volume for the combustion but, at the same time, have insufficient surface for the transmission of the required amount of heat. Also, it is just as possible so to design the kiln that the volume for combustion is inadequate for the surface available to the transfer of heat. When the proportion of combustion volume to heat transfer surface is too great, the system will be wasteful with fuel. When the propor-

tion of heat transfer surface to volume is too great, then the first cost of the kiln, and the carrying costs of the additional investment, are too high. In other words, there is some optimum balance or ratio between the volume and surface at which the cost per ton of material produced will be a minimum.

Characteristics of the Cylinder

For these computations, the dimensions of the kiln shell will be used in this study. Here, again, there will be some who will object; but this course is valid nevertheless. When these dimensions are used as the basis for deriving the coefficients, then these coefficients are applicable to the use of these dimensions in further computations.

The rotary kiln shell is substantially a cylinder, or a series of cylinders, the diameters of which may be different, joined end to end. For our present purpose only cylinders having one diameter throughout their length will be used.

It will be interesting to know some of the properties of the true cylinder. A few of these are:

$$A_1 = \text{cross-sectional area} = \frac{pi \times D^2}{4}$$

$$V = \text{volume} = \frac{pi \times D^2 \times L}{4}$$

A_2 = cylindrical surface = $pi \times D \times L$ wherein D is the diameter and L is the length. Pi is the ratio of the circumference to the diameter of the circle, 3.14.

The ratio of A_2 to V is:

$$\frac{A_2}{V} = \frac{pi \times D \times L}{\frac{pi \times D^2 \times L}{4}} = \frac{4}{D}$$

This relation tells us that, for any cylinder of equal length, the ratio of the cylindrical surface area to the volume decreases as the diameter increases. In other words, for cylinders of equal length, the square feet of cylindrical surface per cubic foot of volume decreases as the diameter increases. Table 3 shows this relation (Figure 3).

Thus it will be appreciated that the effects of a volume phenomenon on a surface phenomenon, within a zone of fixed length, will be intensified with an increase in diameter. When the diameter is doubled, it may be assumed that the volume effect on the surface will be doubled, or nearly so. Later, as we get into it, this will help to explain why a properly proportioned kiln twice the diameter of another kiln will produce about eight times as much product with only four times the surface. By doubling the diameter, the effectiveness of the heat transfer surface is doubled. The cumulative effects result in a productive capacity eight times as great.

Table 3

Diameter (feet)	Sq. ft. of Surface per cu. ft. of Volume
6	.666
7	.571
8	.500
9	.445
10	.400
11	.364
12	.333

The larger kiln produces a ton of lime with less surface than the smaller kiln. And since the first cost of the kiln will be measured more nearly by its surface than by its volume, it is highly desirable to have the kiln diameter as large as possible for the production rate desired. Using the above case as an example, it will be far more economical in first cost to install one properly proportioned 12 ft. diameter kiln than to install eight properly proportioned 6 ft. diameter kilns to produce the same quantity of material. Unless there is a factor that demands a variance in the productive capacity, or unless the capacity exceeds that of a practical kiln size, the larger units will prove to be more economical than smaller units.

Although the fuel-burning process is a volume phenomenon usually, the flame is so controlled generally as to keep it confined as nearly as is practical to the firing end of the kiln. There are several very good reasons for this. In the first place, the release of the fuel heat within the limits of a smaller area of the cylinder surface will result in a higher rate of heat transfer, and, therefore, tend to develop higher temperatures, than when this heat is released within an extended area.

It is true that some kiln operators prefer a long, lazy, relatively cool flame to a short, hot, snappy flame. They accomplish this flame shape either by the addition of steam to the fuel stream, or by introducing some of the kiln gases with the air for combustion, or by reducing the quantity of primary air for combustion. The only advantage of this practice is that the operating crews are less likely to produce over-burned, or dead-burned, lime. The other features of this practice will prove to be economic disadvantages.

But to go on. In the second place, there is the assurance, with the shorter fire, that there is ample high-temperature heat available where it is most needed. From the previous study it was learned that, in some instances, considerably less high-temperature heat is available than required to balance the low-temperature heat requirements. This results in a waste of low-temperature heat in the kiln gases. In the third place, the short flame allows more of the kiln length to be used in drying and preheating. And in the fourth place, the kiln gases are not diluted, so that less heat is lost when they pass pass from the kiln.

Table 4—Effects of Enriched Air in Producing High-temperature Heat

Per cent of O_2 in Combustion Air Weight	Pounds Air per lb. Coal	Pounds of Combustion Gas per lb. Coal	Theoretical Flame temp. Deg. F.	H-T-H per pound Coal (Btu)
23	10.00	10.96	4560	5,950
30	7.70	8.66	5780	8,120
40	5.75	6.71	7450	9,500
50	4.60	5.56	9000	10,200
60	3.84	4.80	10400	10,600
70	3.29	4.25	11750	10,950

As a consequence of the general advantages of the short, hot flame, the practice of confining the combustion process itself well to the firing end of the kiln is quite general. This results in a very peculiar feature in that, regardless of the diameter of the kiln, the length of the flame is held to within about 40 ft. of the kiln length. This means, then, that the volume of the flame is limited more by the kiln diameter than by length. Thus the heat-release, or combustion rate, is governed largely by the cross-sectional area of the kiln.

Actually, the pressure drop through the kiln also influences the capacity of the system to utilize the fuel properly. Normally, natural draft is adequate; but in many cases exhausters are used so that the pressure drop through the kiln can be closely controlled. As mentioned earlier, there may be some hidden advantages, however, not yet examined, wherein the use of positive pressure above atmospheric will be applied to force the gases through the kiln.

It may be well, while studying combustion, to examine casually the use of enriched air. It is possible that by adding oxygen to the combustion air, a reduction can be made in the waste heat of the kiln gases.

The atmosphere contains by weight about 23 per cent of oxygen, and substantially 77 per cent of nitrogen. Each pound of coal requires about 10 pounds of air which contains 2.3 pounds of oxygen. Table 4 shows what can be expected when the air is enriched (Figure 4).

In the previous study, it was shown that about 2,950,000 Btu/ton of lime were the high-temperature heat requirement. Without water in the feed, the low-temperature heat requirement is 1,320,000 Btu/ton of lime. Table 5

Table 5

Wt. per cent of O_2 in Air	Pounds Coal to Supply H-T-H	Total Btu Fired per ton of Lime	Low-temp. Btu in gases	Gas temp. Deg. F.
23	497	6,700,000	3,750,000	1440
30	364	4,900,000	1,950,000	520
40	311	4,200,000	1,250,000	insuff.

shows how the increased availability of high-temperature heat results in a lower exit-gas temperature.

This indicates that enrichment of the combustion air to between 35 per cent and of 40 per cent of oxygen will allow the dry kiln feed plant to operate with a very low stack loss. The recovery of heat from the discharged lime would make it possible to reduce the degree of oxygen enrichment. This feature might warrant a very detailed study, especially for those burning limestone which is fed to the kiln dry. For those using a slurry feed, no especial advantage seem to be indicated.

In the normally operated kiln, the air for combustion is not enriched, and it is provided by natural draft or exhausters. And under these normal conditions, it will be found that ordinarily from 40 to 80 pounds of coal/hr/sq. ft. of kiln cross-section can be burned. It is possible that slightly less oil than the equivalent heat units for coal can be handled because of the additional water vapor involved when burning oil. The smaller kilns have the lower coal-burning ratio per square foot of kiln shell cross-section area.

Heat Transfer

The transfer of heat is a surface phenomenon. Heat is delivered from a surface and is received by a surface. The surface may be a very small unit, such as that of a gaseous atom or molecule, or it may be a comparatively large surface such as the surface of an aggregate of atoms and molecules.

Heat may be transferred by any one, or by any combination, of the three different means; *convection, conduction, radiation.* In the rotary kiln, some of the heat of the flame in the combustion or hot zone is transferred to the kiln walls and the charge or load largely by radiation. As the hot flame-gases pass through the kiln they continue to radiate heat, but at a decreasing rate as they become cooler. Nevertheless, the gases now are flowing, and it is this hot gas, moving over the surfaces in the kiln, that transfers relatively more and more of the available heat by convection. Thus the charge of material in the kiln, and the lining also, receive their heat largely by radiation and convection.

The kiln lining becomes heated to a considerable degree, and some of this heat passes through the blocks by conduction. The escaping heat passes by conduction to and through the kiln shell where, at the outside surface, it is dissipated to the surrounding objects and atmosphere by radiation and convection. This escaping heat comprises the kiln shell heat loss.

The charge of material in the kiln consists of particles of relatively greater or smaller size. On the surface of the charge, those particles that are exposed to the hot gases receive heat similarly to the kiln lining; by radiation and convection. The charge is rolling, however, so that fresh particles are always being exposed. And when the particles are of fairly uniform size, the degree and frequency of exposure is quite uniform though cyclic. When the particles vary greatly in size, the smallest particles are exposed less.

A further source of heat to the particles is in the hot kiln lining which delivers this heat by radiation and conduction.

Within the particle itself, the heat is transferred by conduction from the surface to the center.

A detailed study of the transfer of heat into the particle of calcium carbonate is extremely complicated. Nor is the problem at all simplified by the fact that, above the calcining temperature, a coating of lime, which gets thicker and thicker as time goes on, forms on the surface as the line or zone of calcination penetrates deeper into the particle. Furthermore, the CO_2 gas escaping from the active calcination zone must pass through the layer of lime in a direction opposed to the flow of heat. Thus, some of the heat given to the particle must be used to raise the temperature of the CO_2 before it reaches the surface of the particle.

It can be understood that the computation of the individual heat transfer rates within the kiln are no end complicated.

Heat Transfer Rates

It is necessary, however, to have some idea of the amount of heat transferred, or the amount of heat transferred in a unit of time if we are to compute not only the productive capacity of the system, but also the optimum physical dimensions of the kiln itself, or even to determine by analysis the behavior of a kiln operation under study. Despite the complications and involvements of this problem, some valuable emperical relations of a practical nature have been derived.

A detailed review and study of the performances of many rotary kilns has indicated that the over-all rate of heat transfer *to the charge* in a properly managed operation is between 3,000 and 8,000 Btu/hr/sq. ft. of kiln shell surface. One is amazed to find the rate lower with the kilns of smaller diameter—until it is recalled that this is what was predicted by the study of the simple cylinder features.

Another method of studying the problem of heat transfer rates involves the fundamental relation between the productive capacity of the kiln and its physical dimensions. This relation itself was the result of a study of rotary kiln operations by the writer over a period of years, and was first published in *Rock Products* seven or eight years ago. This particular study revealed that within the range of kiln sizes observed, that:

$$T_d = \frac{kD^2L}{100}$$

Wherein:

T_d is the tons of material produced per day.

D is the kiln shell diameter in feet.

L is the length of the kiln shell in feet.

k is the production coefficient, usually having a value of from 1.0 to 1.5 depending on the type of material being processed, and the manner in which the kiln is operated.

Within its limitations, this relation can be used to determine the overall heat transfer rate since it holds all the elements necessary for this purpose. It holds the equivalent of heat involved in the form of the weight of material produced. It includes the element of time in that weight is a time-rate of production. It includes the elements of the kiln shell surface since it includes the physical dimensions of the shell. It remains only to develop and rearrange the relation into the terms desired.

Beginning with the fundamental production relation, then:

$$T_d = \frac{k \times D^2 \times L}{100} = .01 \times k \times D^2 \times L$$

In the case of lime, each ton of product represents a definite quantity of heat. The various heat requirements already have been given.

Wet Feed Kiln

In the wet feed kiln, the total heat requirements (when the moisture content of the feed is 40%) is 6,740,000 Btu/ton of lime produced. So:

$6{,}740{,}000 \times T_d$ = Btu/day added to the lime,

or

$\frac{6{,}740{,}000 \times T_d}{24}$ = Btu/hr. added to the lime.

Now, in order to derive the element of area from the right hand member of the relation, it too much be modified

(Turn to page 62)

Solubilities of Waxes

T. T. COLLINS, Jr.

Thilmany Pulp & Paper Co.

The author is well known to readers of THE PAPER INDUSTRY. Among his contributions to this magazine are such outstanding articles as "The Scrubbing of Sulphate Recovery Furnace Gases" . . . "Sulphite Turpentine—A Review of the Literature" . . . "Zein—Its Use in Coatings."

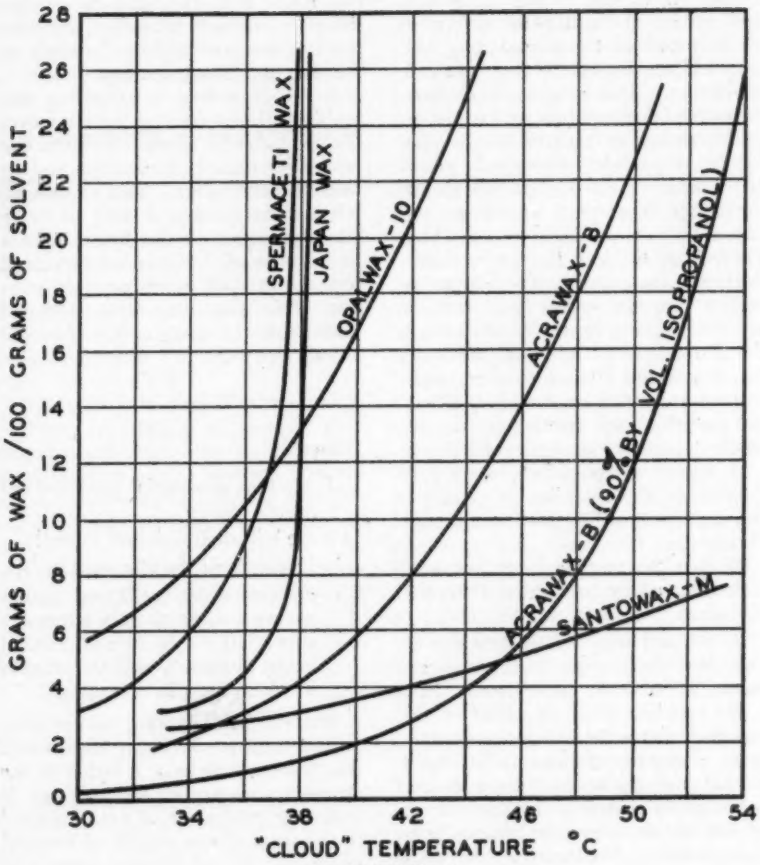


FIGURE 1

SOLUBILITIES OF WAXES IN 99% ISOPROPYL ALCOHOL

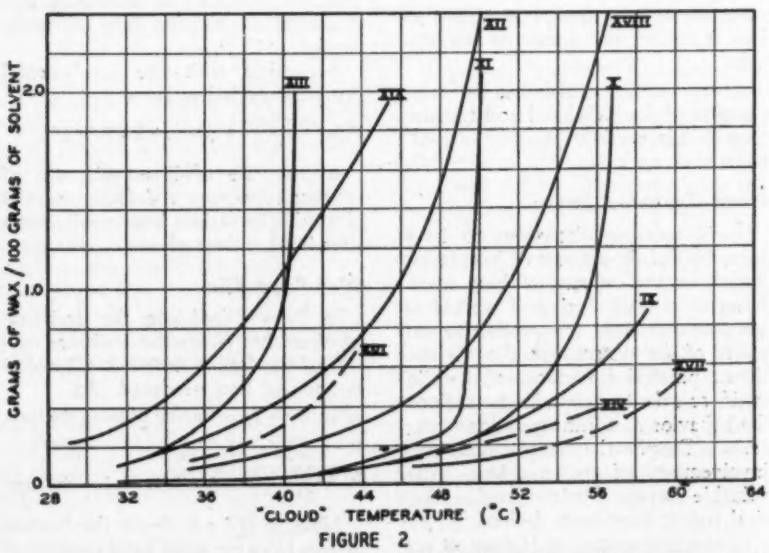


FIGURE 2

SOLUBILITIES OF 138/40 °F A.M.P. PARAFFIN IN VARIOUS SOLVENTS
BROKEN LINES INDICATE FAINT TURBIDITY IN WAX SOLUTION

▶▶▶ THEORY AND PRACTICE of the past regarding the use of various waxes in lacquers have not given serious consideration to the fact that it is possible to formulate for coating paper so-called "moisturevaporproof" lacquers which use alcohol as the solvent. Although paraffin waxes are among the most efficient moisturevaporproofing materials available for use in lacquers, their relative insolubility in alcohol has apparently precluded general application in certain solvent coatings. The use of a number of alcohol-soluble waxes or waxy materials for this purpose also seems to have been overlooked.

Successful incorporation of a wax in an alcohol solvent coating would depend, among other things, upon the solubility of the wax in the lacquer mixture. In various studies on the dewaxing of mineral oils by treatment with alcohols, etc., some data on solubilities and methods of measurement have been given.

Poole *(1)* found that ethyl alcohol seems to have no solvent power for wax but isopropyl and the higher alcohols do, apparently because of the increase in chain length or molecular size. Quantitative determination of the wax dissolved in alcohol was made by placing the solvent on an excess of solute (wax) in a test tube and allowing it to stand overnight at the desired temperature. A portion of the supernatant solution was then weighed out, the solvent evaporated, and the wax residue weighed. Apparently Poole made no tests to show that his wax solution had reached equilibrium in this time period. Poole *(2)* later studied wax solubility in propyl or isopropyl alcohol and found very low values but the temperature range for the study was quite low.

Henderson and Ferris *(3)* determined solubility of a wax in acetone

in Alcohols and Other Solvents

and other liquids by determining the temperature at which a cloud of the solute appears in the solution on cooling and disappears on heating gently. Carlisle and Levine *(4)* point out that determining the cloud temperatures of known mixtures of wax and solvent is a correct method for determining solubility only if the solid constituent is a pure compound. Actually, determining the solute in a solution is correct only under the same circumstance. In the case of waxes, which are complex mixtures, the cloud temperature data represent the solubility of the least soluble components. The solubility values are consequently lower than those obtained when an excess of wax is extracted with a solvent at a given temperature and an aliquot removed and evaporated. This latter procedure gives a solubility value in which the most soluble constituents have weight out of proportion to their percentage in the wax.

Smith *(5)* has shown that anhydrous isopropyl alcohol has more solvent power for wax than the same alcohol containing a little water.

Tonn and Schoch *(6)* used the method of Poole to determine curves of solubility for cotton wax in various alcohols. It was noted that the solubility increases as the chain length of the alcohol increases.

Ferris and Cowles *(7)* have found that the higher the melting point of the paraffin wax, the lower its solubility in certain solvents. When plotted on semi-log paper, the solubility of their wax sample in isopropanol is a straight line.

Pawlewski and Filemonewicz *(8)* determined the solubility of ozokerite in various of the lower alcohols and noted the lowering of the wax solubility when the alcohol contains water. Sturken (9) has stated that carnauba wax is soluble in ethyl alcohol.

The data of Poole has been reviewed in the extensive book on waxes by Bennett *(10)*. The solubilities of paraffin waxes and Santowaxes in various alcohols at comparatively low temperatures are given. This investigator also gives data for the solubilities of beeswax, candellila, montan, carnauba, and ozokerite waxes in butyl alcohol. The precipitation method was used to measure this and this is essentially the determination of the cloud temperature upon cooling of a sample dissolved in boiling solvent. This author also shows that a study of the alcohol-soluble fractions of the various waxes is important in identifying the waxes and the quantity of adulterants.

As a preliminary to a study of the preparation of an unconventional moisturevaporproof lacquer using alcohol as the solvent, it was necessary to determine the solubilities of various waxes or waxy materials in alcohols and other solvents. The method of Poole *(1)* was investigated and it was found that this procedure gave varying results because longer than 16 hours was required for the solvent to become saturated with the wax unless the wax was dissolved in hot alcohol and then cooled to the desired temperature. Because of the ease of manipulation of the cloud temperature procedure and also the fact that this investigator was interested in the solubility of the *least* soluble components of the wax, this method was used.

Wax and any other solid materials were weighed into a flask together with the solvent and the mixture heated

(Turn to page 62)

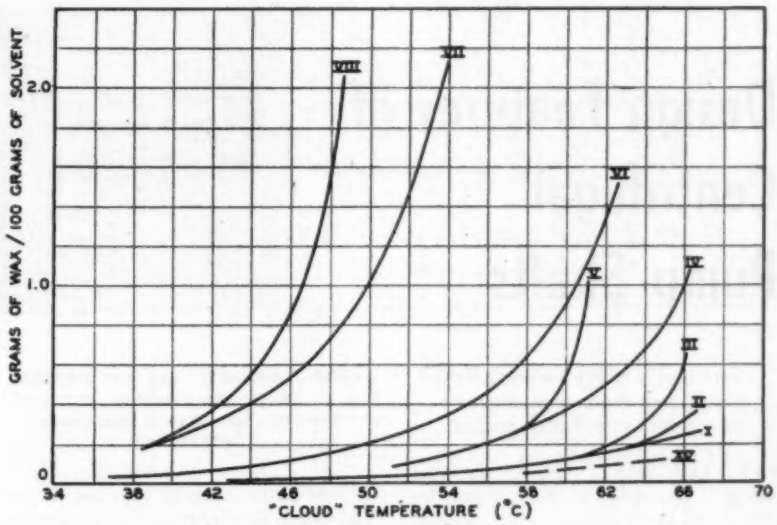


FIGURE 3

SOLUBILTIES OF ARISTOWAX 180/65 IN VARIOUS SOLVENTS

(BROKEN LINES INDICATE FAINT TURBIDITY IN WAX SOLUTION)

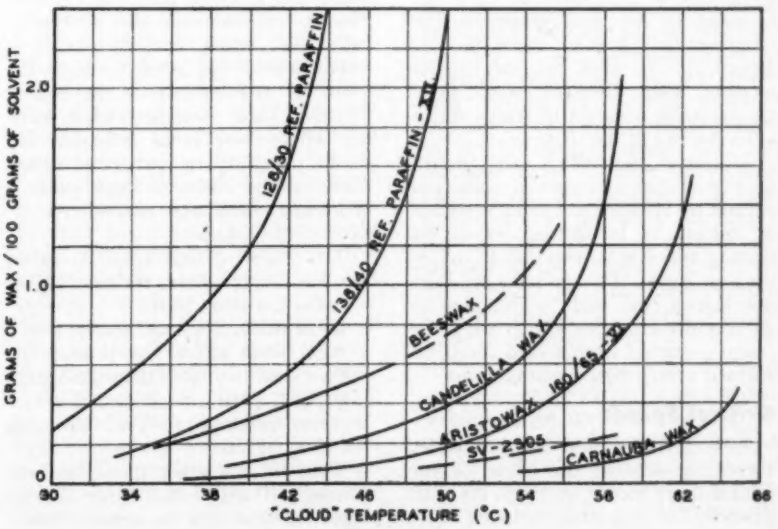


FIGURE 4

SOLUBILITIES OF WAXES IN 99% ISOPROPYL ALCOHOL

(BROKEN LINES INDICATE FAINT TURBIDITY IN WAX SOLUTION)

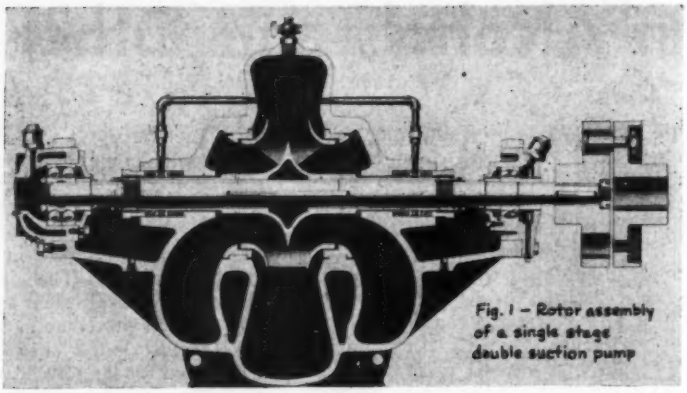


Fig. 1 – Rotor assembly of a single stage double suction pump

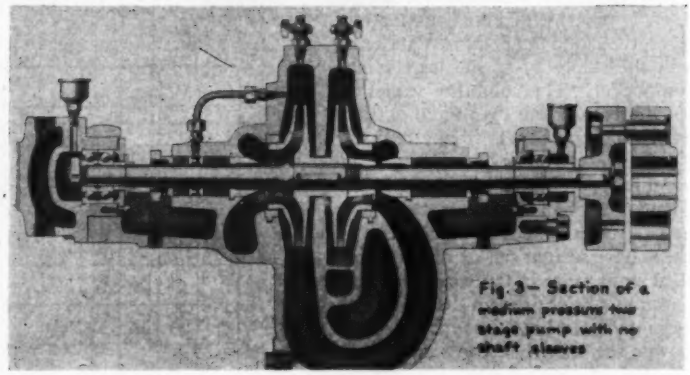


Fig. 3 – Section of a medium pressure two stage pump with no shaft sleeves

Design Features of Centrifugal Pump Shafts

Part 6 of a series covering design, operation and maintenance of centrifugal pumps.

IGOR J. KARASSIK and ROY CARTER
Application Engineers
Worthington Pump & Machinery Corporation

▶▶▶ THE SHAFT OF a centrifugal pump is the center of the rotating element, and is designed to give a certain maximum deflection. This generally results in shaft diameters in excess of safe needs of actual strength for torque transmission. The transverse loading, its distribution, the shaft span, and the diameter of the shaft determine the minimum deflection for the static conditions, that is, when the pump is not rotating. When the shaft rotates, there are naturally reversals in stress, which affect the life of the shaft.

In general, the shaft is proportioned so that it can successfully withstand stresses set up when the pump is started up quickly, as, for instance, when the driving motor is thrown directly across the line. Again, if the pump is handling hot liquids, the shaft is designed to withstand the stresses set up when the pump is started from a cold condition without a preliminary warming-up.

Critical Speeds

It would be useless and tedious to present a detailed discussion of the critical speed theory, but since the shaft diameter is intimately selected with critical speed, it is necessary to present a few facts of a general nature on this subject.

Any article made of an elastic material has a natural period of vibration. If a pump rotor or any shafting is rotated at any speed that corresponds to the natural frequency of the shaft or rotor, any minor unbalance will be magnified. These are the critical speeds. Due to variations in the density of metal and minor irregularities it is impossible in any rotor to have the center of mass exactly on the axis of rotation. Thus, even in vertical shafting where there is no deflection due to the weight of the parts, this eccentricity of the center of mass causes a centrifugal force and, therefore, a deflection and vibration.

The lowest critical speed is called the first critical speed, the next higher is called the second, etc.

In centrifugal pump nomenclature, a rigid shaft means one whose first critical speed is higher than the operating speed, while a flexible shaft is such that the operating speed is higher than its first critical.

Once the operating speed has been selected, it still remains for the designer to determine the relative dimensions of his shaft, in other words to decide whether the pump will operate above or below the first critical speed. Generally speaking, the shaft dimensions of single-stage centrifugal pumps are such that the operating speed is considerably lower than the first critical. However, the designer has to face this problem when it comes to laying out a multistage pump.

It is true that the maximum vibration of the revolving shaft and the parts attached thereto will occur at the critical speed. However, any deviation from the exact value of the critical speed restores to the shaft its elastic resistance.

The foregoing should not give the impression that operation of a shaft at exactly the critical speed would be fatal. The amount of vibration involved depends primarily upon the amount of unbalance of the shaft and of the rotating mass. Fine workmanship and careful balance reduce the possible vibrations to an imperceptible minimum.

It must be further considered that a pump, even though it may pass through a critical speed, does it so quickly that no perceptible vibration may occur. Thus, if the total time from rest to full 3550 rpm speed is 2 seconds and the critical is, let us say, 2200 rpm, the time elapsing while the pump passes from —10 per cent to +10 per cent of the critical will be of the order of two tenths of one second.

In order to understand the effect of critical speed selection upon the shaft size, it is necessary to consider that

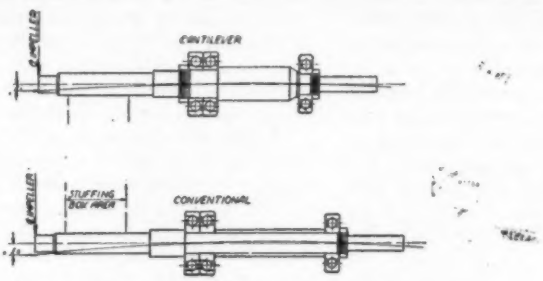


Fig 2 – Cantilever and conventional shaft designs

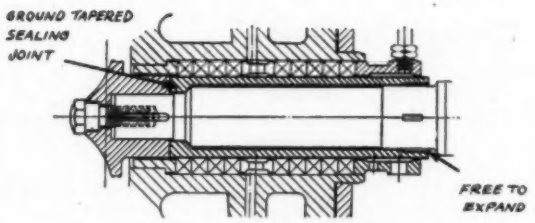


Fig 7 – Sleeve with 45 degree bevel contacting surface

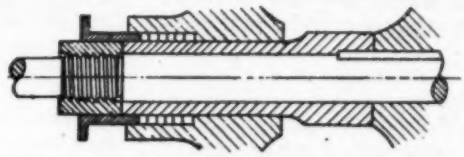


Fig. 4 – Sleeve with external lock-nut and impeller key to prevent slip

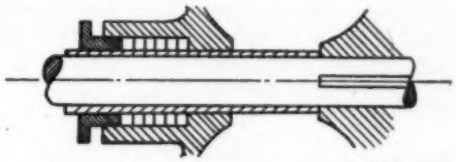


Fig. 5 – Plain brass tube sleeve

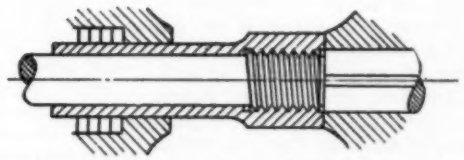


Fig 6 – Sleeve threaded into shaft, no external lock-nut

the first critical speed of a shaft is linked to the static deflection of this shaft by an immutable mathematical relation. The shaft deflection is dependent upon the weight of the rotating element, the shaft span and the shaft diameter, the basic formula being:

$$f = Wl^3/mEI$$

where

f = deflection in inches

W = weight of the rotating element

l = shaft span in inches

m = coefficient depending on method of shaft support and distribution of load

E = modulus of elasticity of the shaft material

I = moment of inertia, that is $\pi d^4/64$

It must be mentioned that this formula is given in its most simplified form, that is for a shaft of constant diameter. If, as is usually the case, the shaft is of varying diameters, the calculations for shaft deflection are more complex and generally it becomes more practical to solve for the deflection graphically.

It is also necessary to remember that this formula solves for the static deflection which alone enters into the computation of the critical speed. The actual deflection of the shaft—which needs be determined to establish the minimum permissible internal clearances—must take into account all the transverse hydraulic reactions on the rotor and other external loads, such as belt pull as well as the actual weights of the rotating element.

For practical purposes, the first critical speed in rpm can be calculated as:

$$Nc = 187.7\sqrt{f}$$

A 1750 rpm operating speed necessarily involves a shaft having a critical speed above the operating speed—one where the calculated deflection is about 0.005 in. to 0.006 in., so that contact of the rotor with the stationary wearing rings is avoided. On 3600 rpm multistage pumps, shafts of equal stiffness are used, again to avoid contact at the wearing rings. However, the corresponding critical speed in this case is below the operating speed, somewhere between 60 and 75 per cent of the latter. This is sufficient margin to avoid potential danger of operation in the close vicinity of the critical.

Summing up, it can be said that as long as the operating speed is sufficiently removed from the critical speed, and as long as the shaft deflection is properly taken in consideration in setting the running clearances, it matters very little whether the first critical speed is above or below the operating speed. A well balanced pump with a flexible shaft is a safer piece of equipment than a poorly balanced, rigid shaft pump.

Shaft Design Details

It has been stated that shaft diameters are generally in excess of the dimensions actually needed to transmit the torque. This, incidentally, is as it should be, for ease of assembly demands that the shaft diameter be stepped up several times from the coupling end to its center where the impellers are to be mounted. Figure 1, which shows a typical shaft assembly for a single stage pump, illustrates this excellently. Starting with the maximum diameter at the impeller mounting, there is a step-down for the internal nuts holding the impeller, a second step-down for the shaft sleeve, a third for the external or sleeve shaft nut, followed by several more steps for the bearings and the coupling. It is clear, therefore, that the shaft diameter at the impellers not only exceeds that required at the coupling for torsional strength, but care must also be taken in the design to provide sufficient diameter difference for the necessary steps.

One frequent exception to the oversizing of the shaft at the impeller mounting is the case of units made up of two double suction single stage pumps operating in series when one of the pumps has a double extended shaft. Since this pump has to transmit the total horsepower for the entire series unit, the shaft diameter at its

inboard bearing may have to be increased in excess of the normal diameter.

The shaft design of end suction, overhung impeller type pumps presents a somewhat different problem. One of the solutions used to reduce the shaft deflection at the impeller and at the stuffing box (where concentricity of running fits is extremely important) consists of increasing the shaft diameter very appreciably between the bearings, as illustrated in Figure 2. This design, incidentally, permits shortening the shaft span between the bearings and results in a much more compact unit.

Shaft Sleeves

The function of a shaft sleeve is to protect the shaft from corrosion, erosion and wear. By the use of shaft sleeves, wear, erosion and corrosion do not affect the strength of the shaft and the cost of maintenance is reduced. There are many forms of shaft sleeves used in centrifugal pumps, the most common being those used to protect the shaft where it extends through a stuffing box. Generally sleeves serving other functions are given specific names to designate their purpose.

In extremely small size pumps, the use of shaft sleeves presents a certain disadvantage. Since the shaft sleeves cannot contribute to the strength of the shaft to any appreciable degree, the shaft itself must be designed for the full maximum stress. The shaft diameter is then increased very materially through the addition of the shaft sleeve since the thickness of the latter cannot be decreased beyond a certain safe minimum. As a result, the impeller suction area may become dangerously reduced, unless the eye diameter is increased to maintain a constant eye area, which in turn increases the pickup speed unfavorably. Further disadvantages result from increased hydraulic and stuffing box losses resulting from an increase in the effective shaft diameter out of proportion to the small size of the pump.

In order to eliminate such shortcomings, very small pumps are frequently furnished with stainless steel shafts which have metallurgical properties of corrosion and wear resistance sufficient to permit satisfactory operation without shaft sleeves. Such a pump is illustrated on Figure 3. It must be noted that this also leads to a less expensive construction and that the cost of replacing a stainless steel shaft when it is sufficiently worn is of the same order of magnitude as the cost of new sleeves plus the cost of their installation.

An interstage or distance sleeve is a shaft sleeve used to protect the shaft between the impellers of a multistage pump. In some cases, these impellers are cast with long hubs, so that they perform the same duty, eliminating the necessity for the sleeve.

Shaft sleeves are generally keyed to the shaft itself and further secured by an external locknut, as illustrated in Figure 4. However, designs exist using either a plain brass tube pressed over the shaft, or a sleeve threaded on the shaft without an external locknut. (See Figures 5 and 6.)

When pumps are specifically designed for high temperature or high pressure service, a refinement of construction may be introduced, consisting of packing between the shaft sleeve and the adjoining impeller hub, which prevents all possibility of leakage between the sleeve and the shaft.

Another design intended to accomplish the same results is illustrated in Figure 7. The contact surface of the sleeve is machined with a 45-degree bevel and while one end of the sleeve is locked, the other end is free so that it may expand without constriction under the effect of temperature.

Rotary Kilns . . . *Continued from page 57*

and rearranged. This is done by multiplying by pi and dividing by D so that:

$$\frac{pi \times k \times .01 \times D^3 \times L}{D} = .01 \times pi \times D \times L$$

when k is 1.0 wherein $pi \times D \times L$ is the kiln shell surface area.

Both sides of the equation must be multiplied by the same new elements, so that:

$$\frac{6{,}740{,}000 \times T_d \times pi}{24 \times D} = \frac{6{,}740{,}000 \times pi \times .01 \times D^3 \times L}{24 \times D}$$

or:

$$\frac{280{,}000 \times T_d \times pi}{D} = 2800 \times pi \times D \times L$$

Now $280{,}000T_d = Q =$ Btu/hr introduced into the lime, and $pi \times D \times L$ is equal to the kiln shell surface or A_s. So we have:

$$\frac{Q \times pi}{D} = 2800 \times A_s$$

or:

$$\frac{Q}{A_s} = \frac{2800 \times D}{pi}$$

$890 \times D$ Btu/hr/sq.ft. kiln shell surface.

Here again is that amazing feature, indicating that the over-all heat transfer rate per square foot of kiln shell surface increases with the diameter of the shell.

Dry Feed Kiln

A similar study on the dry feed kiln results in:

$$\frac{Q}{A_s} = 567 \times D \text{ Btu/hr/sq.ft. of kiln shell surface.}$$

The difference between the two, the wet and dry fed kilns, will be found in the ability of the wet feed kiln to absorb more low-temperature heat than the dry fed kiln. Table 6 shows the numerical relations of the above formula (Figure 5).

Table 6

Kiln diam. (feet)	$\frac{Q}{A_s}$ Wet Feed	$\frac{Q}{A_s}$ Dry Feed
4	3,560	2,268
5	4,460	2,835
6	5,350	3,402
7	6,250	3,969
8	7,130	4,536
9	8,020	5,103
10	8,900	5,670
11	9,800	6,237
12	10,700	6,804

This confirms our previous findings that it is desirable to design the kiln so to have the largest feasible diameter. It must have such a length, however, that ample time will be allowed to add to the charge the required amount of heat with a minimum of waste in the gases.

With this information available, crude as it is, it is now possible to make a study of the optimum kiln dimensions.

Solubility of Waxes . . . *Continued from page 59*

(usually to boiling) until the solids dissolved. The flask of solution was allowed to cool in the air with continual swirling so that localized cooling at the wall of the flask would not occur. The temperature at which the first faint cloud of precipitating solute occurred was taken as the solubility temperature for that concentration of material.

The data collected during these investigations of wax solubilities have been plotted in Figures 1, 2, 3 and 4.

Material	Source
Aristowax 160/65	Union Oil Co. of Calif.
Paraffin 138/40	Moore and Munger
Paraffin 128/30	Moore and Munger
Acrawax B	Glyco Products Co., Inc.
Stabelite Resin	Hercules Powder Co.
No. 3 Carnauba Wax	Candy and Co.
SV-2305 (Microcrystalline wax)	Socony-Vacuum Oil Co.
Beeswax	J. T. Baker Chem. Co.
Opalwax-10	DuPont
Santowax-M	Monsanto Chemical Co.

In addition, the solubilities of Hercules Powder Co.'s Chlorafin 70 (chlorinated paraffin), Strahl and Pitsch's bleached ozokerite wax AC-160, and unbleached montan wax were found to be less than 0.2 gram per 100 grams of 99 per cent isopropanol at 70 deg. C.

These curves show several interesting facts, some of which have been discovered by earlier investigators.

1. The addition of a slight amount of water to the solvent lowers its solution power for a given wax.

2. The lower the melting point of a paraffin wax, the greater the solubility in an alcohol at any given temperature.

3. The greater the chain length of the alcohol, the higher its solvent power for a paraffin wax.

4. In the presence of rosin or a rosin derivative, the solubility of paraffin wax in a solvent at elevated temperatures is increased.

5. Contrary to the opinion of some of the workers in this field, paraffin waxes appear to have sufficient solubility in alcohol to make possible the formulation of moisturevaporproof lacquers based on alcohol as the solvent.

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Cuban Pulp and Paper Industry

ROBERT S. ARIES[1]

▶▶▶ THE PULP AND paper industry in Cuba presents an interesting picture of a country with considerable local consumption, and interesting prospects, because of expanding markets and the availability of cellulosic raw material.

The annual capacity today is about 30,000 tons of paper used primarily as wrapping and bag paper, and about 7,500 tons of paperboard used for folding and setup boxes. Two mills account for this output. Very little kraft is used in paper board, the bulk being chipboard. About 500 tons of toilet tissue and 700 tons of other tissue papers are made, as well as about 10,000 tons of kraft wrapping paper and 7,000 tons of sulphite wrapping paper.

Domestic and most imported paper is converted into grocery bags, folding and setup boxes, toilet tissues and napkins, corrugated cartons, envelopes, and paper towels, with some being converted to waxed paper, gummed paper products, and writing paper.

The two local mills, using their own paper, and protected by a tariff, turn out relatively low-cost products. Imports of foreign made grocery bags are almost nonexistent, and are limited entirely to high-quality items not produced in Cuba. One large converter produces boxes and other paper products from imported paper, but the tonnage is very small.

Nearly all corrugating materials are imported from the United States, and are used in the manufacture of corrugated cartons by eight manufacturers with a combined capacity for handling about 750 tons of kraft board monthly. These locally produced cartons are generally of inferior quality as compared with containers made in the United States, and are manufactured for a price market rather than for quality.

There is an additional *sub rosa* source of cartons and boxes amounting to about 20,000 tons. These are containers shipped with merchandise from the United States, and re-used by Cuban exporters of liquor and other merchandise.

Nearly all the domestic paperboard is used in the manufacture of lightweight folding and setup boxes. This is supplemented by additional tonnage imported chiefly from the United States.

There are at least eight manufacturers of envelopes producing almost all the envelopes required, although there are some small imports of specialty items which are not in great demand.

Paper suitable for toilet tissues, napkins, and paper towels is imported in large amounts for conversion by local mills, and supplemented by tissue and similar paper produced locally. A small amount is imported in the converted form.

(1) Consulting Engineer and Professor of Chemical Engineering, Polytechnic Institute of Brooklyn, N. Y.

Paper imports to Cuba, according to the Office of International Trade U. S. D. C., may be roughly broken down as follows for 1947 (in per cent): printing paper, 47; paperboard, 11; writing paper, 9; tissue and similar papers, 6; wrapping paper, 5; converted paper products, 5; miscellaneous, 17.

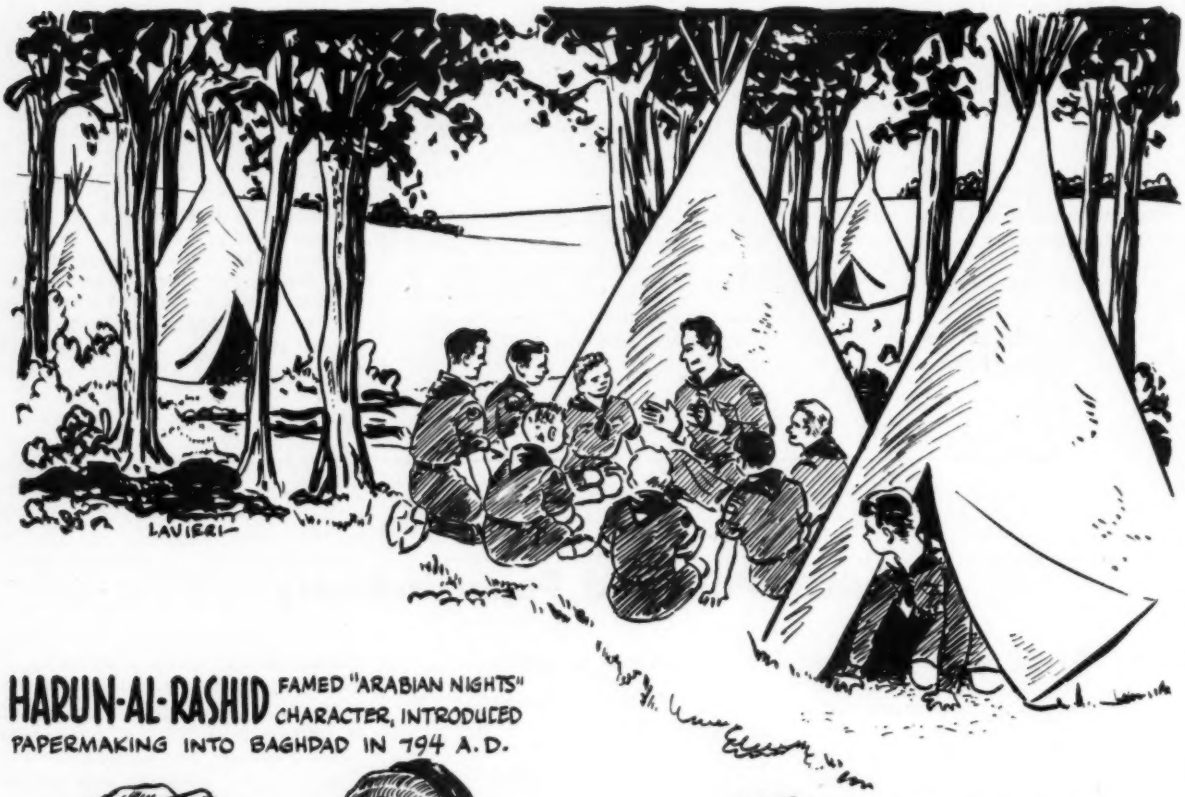
The newly erected rayon plant in Cuba consumed imported pulp exclusively. Some thoughts are being formulated to provide a local supply of high alpha pulp.

Future of the Industry

The Cuban Pulp and Paper Industry is expected to grow in order to satisfy the expanding demands on the island. It is expected that bagasse will supplement to a considerable extent the imports into Cuba. In fact, Cuba may become a pulp, paper and wallboard exporting nation. The bagasse fiber from sugar cane manufacturers which is now burned or wasted, constitutes a tremendous reservoir of cellulose. Since fuel oil is a more efficient source of heat, bagasse could readily be made available by many of the mills.

Progress in its pulping has been considerable and at least two commercial installations exist today in the world. Bagasse could be used directly or as an extender to most paper products, and be the source for excellent hard and soft wallboards.

PAPER SKETCHES

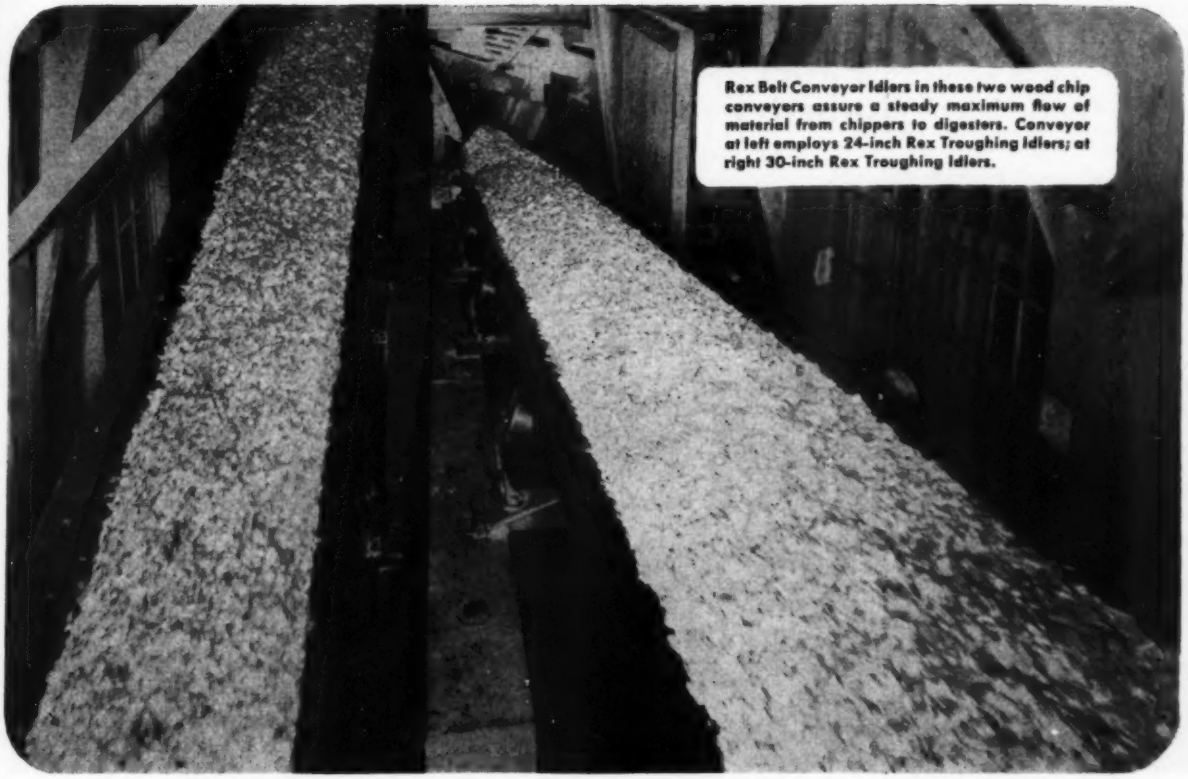


HARUN-AL-RASHID FAMED "ARABIAN NIGHTS" CHARACTER, INTRODUCED PAPERMAKING INTO BAGHDAD IN 794 A.D.

65 TEPEES MADE FROM SISAL-KRAFT PAPER ARE TO HOUSE THE COUNCIL OF THE FOND DU LAC BOY SCOUTS OF AMERICA AT THE NATIONAL JAMBOREE AT VALLEY FORGE, JUNE 30 TO JULY 6.

IN THE TIME OF QUEEN ELIZABETH, DANDIES USED CASES MADE OF PASTE-BOARD TO PRESERVE THE SHAPE OF THEIR BEARDS WHILE SLEEPING.

A NOVELTY OFFERED TO TRAVELERS IN 1884, WAS A LITTLE THREE-INCH SQUARE BOOK CONTAINING FIFTY SHEETS OF SOAP-COATED PAPER.



Rex Belt Conveyor Idlers in these two wood chip conveyors assure a steady maximum flow of material from chippers to digesters. Conveyor at left employs 24-inch Rex Troughing Idlers; at right 30-inch Rex Troughing Idlers.

Rex Idlers make money for you!

Whether you're handling wood chips or refuse, Rex Belt Conveyor Idlers make money for you. How?

First, the basic design of these long-lasting idlers practically eliminates power consumption, and the well-balanced roll units are exceptionally easy on the belt.

Second, the Rex triple labyrinth grease seal keeps grease in . . . dust out, and assures almost indefinite life to the extra capacity tapered roller bearings.

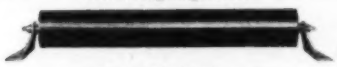
Third, each idler roll is a sturdy unit in itself, removable and completely interchangeable.

Fourth, the rugged, durable construction of the rolls means maximum roll life, and economical idler service.

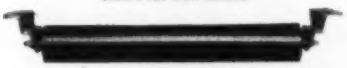
These cost-cutting Rex features mean important savings to you in longer life for both idlers and belts, lowest maintenance and repair costs, simplified inventory, plus dependable unfailing idler service.

Rex Belt Conveyor Idlers

Rex Troughing Idlers



Rex Flat Belt Idlers



Rex Return Idlers

Many other types of Rex Idlers are also available as well as a complete line of pulp mill chains, pulpwood and refuse conveyors, white water recovery equipment, process and waste screening equipment.

For the complete story on these money-making idlers, mail the coupon at the right.

CHAIN BELT REX COMPANY

Belt Conveyor Idlers

CHAIN BELT COMPANY
of Milwaukee

CHAIN BELT COMPANY
1714 West Bruce Street
Milwaukee 4, Wis.

Gentlemen:

( ) Please send Bulletin No. 463 R.

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Company.....*Dept*.....

Address.....

City.....*State*.....

PROMINENT PARTICIPANTS in the meeting of the Woodlands Section of CPPA were (L to R): J. W. Paterson (E. B. Eddy Co.), chairman of the Section and general chairman of the meeting; Dr. L. R. Thiesmeyer (Pulp and Paper Research Institute of Canada), who spoke at luncheon; and W. A. E. Pepler, manager of the Section

NEW CHAIRMAN of the Woodlands Section, CPPA, is Gordon Godwin (left), Ontario Paper Co., Ltd. J. B. Matthews (right) of Abitibi Power & Paper Co., Ltd., is new vice chairman

Woodlands Section CPPA Holds 32nd Annual Meeting

▶▶▶ SOME 700 FORESTERS, woods managers, engineers, scientists and executives of the pulp and paper industry in Canada and the United States attended the 32nd three-day annual meeting of the Woodlands Section of the Canadian Pulp and Paper Association, held at the Mount Royal hotel, Montreal, P.Q., Canada, March 22-24. W. A. E. Pepler is the Section's manager.

The extensive program of the first day session, prepared by A. Koroleff, director of woodlands research, Pulp and Paper Institute of Canada, Montreal, was devoted to research problems in the forests. R. G. MacFarlane, woods manager, Fraser Companies Ltd., Edmundston, N.B., chairmanned the first general session; J. W. Paterson, chairman of the Woodlands Section, and woods manager, the E. B. Eddy Co., was general chairman.

Papers Presented

Four brief papers on portable chippers, planning woods operations, aerial means of forest fire suppression, and camp heaters were presented, followed by substantial discussion by the delegates on each subject.

Richard H. Fenton of the Northeastern Forest Experiment Station, U.S. Forest Service, Storrs, Conn., outlined the possibilities of portable chippers in the utilization of wood waste for pulping, compost or fuel. C. R. Silversides, Abitibi Power and Paper Co. Ltd., Toronto, and other speakers discussed planning woods operations and various respective factors of importance, under study by the Pulp and Paper Research Institute. A. Koroleff, Pulp and Paper Research Institute, spoke on Aerial Means of Forest Fire Suppression, and C. H. Duff, Canadian International Paper Co., discussed Camp Heaters.

Forestry Research Discussed at Luncheon

Dr. L. R. Thiesmeyer, recently elected president of the Pulp and Paper Research Institute of Canada (Cf. P.I., Jan., 1950), gave the principal address at the annual luncheon, Mar. 22. Discussing the Canadian pulp and paper industry's declared forest policy of perpetual yield, Dr. Thiesmeyer emphasized the part that the discovery of atomic energy may play in forestry, stating that atomic power may well be used in the regeneration, nutrition and stimulation of tree growth, as well as in the extermination of insects and disease. Forestry research, concluded Dr. Thiesmeyer, should consider six points —each project should be specified; overlapping and duplication of work should be avoided by a free exchange of opinions between research agencies;

work should be done on a co-operative basis; adequate finances should be provided; proposals and progress reports should be clearly presented to supporting agencies; and work must be done thoroughly and completely.

Awards for Meritorious Work

Four awards, each of a plaque and $100, for meritorious work in woodlands research and operations, were presented at the luncheon on the decision of the woodlands section. The *J. A. Bothwell Award* for the most meritorious work in 1949 on forest conservation in Canada was presented to R. S. Johnson, chief forester, Mersey Paper Co., Ltd., Liverpool, N.B., by the woods manager of Brompton Pulp and Paper Co., Ltd., Nipigon, Ont., J. H. Merrill. Mr. Johnson's contribution was the introduction and operation of selective cutting methods at the Mersey company.

For his work in connection with the development and functioning of the cable yarding system employed in the Port Arthur, Ont., plant of Marathon Paper Mills of Canada, P. V. LeMay was awarded the *Ellwood Wilson Award* for the most effective industrial application of the research projects instigated and carried out by the woodlands section (in co-operation with the Pulp and Paper Research Institute of Canada) or by a member company. Harold Burk, woods manager, K.V.P. Co. Ltd., Espanola, Ont.

For a paper entitled "Reproduction of Pulpwood Stands," considered by the awards committee to be the best member paper presented during the year on a subject other than mechanization, A. R. McKenzie, assistant chief forester, Abitibi Power and Paper Co., Sault Ste. Marie, Ont., was awarded the *Price Brothers & Co. Ltd.* award. Presentation was made by R. S. Armitage, general woodlands manager, Price Brothers, Quebec.

The *Mechanization Award,* donated by Fraser Cos. Ltd., for the best member paper on logging mechanization, was granted by the woodlands section to E. H. Gunter, logging superintendent, Price Brothers & Co., Rimouski, Que., for his paper "Truck Hauling," and was presented by R. G. McFarlane, woods manager, Fraser Cos. Ltd., Edmundston, N.B.

New Officers

Gordon Godwin, The Ontario Paper Co. Ltd., Montreal, P.Q., formerly vice chairman of the association, was elected chairman at the election of officers held March 23, while Jack B. Matthews, Abitibi Power & Paper Co., Ltd., former council member, was chosen vice chairman.

Seven men, including R. S. Armitage, Price Brothers & Co. Ltd., Quebec, P. Q.; A. H. Burk, The KVP Co. Ltd., Espanola, Ont.; G. Harold Fisk, Pacific Mills Ltd. and Powell River Co. Ltd., Montreal; F. A. Harrison, Canadian International Paper Co., Montreal; R. G. MacFarlane, Fraser Cos. Ltd., Edmundston, N. B.; J. H. Merrill, Brompton Pulp & Paper Co. Ltd., Nipigon, Ont.; and J. A. Michaud, Consolidated Paper Corp. Ltd., Grand 'Mere, P. Q. were re-elected to council membership.

New council members chosen in the elections are J. W. Paterson, The E. B. Eddy Co., Hull, P.Q., retiring chairman; W. G. Phipps, Spruce Falls Power and Paper Co., Kapuskasing, Ont.; and Bruce Southon, Great Lakes Pulp and Paper Co., Fort William, Ont.

Elections were concluded with the re-election of W. A. E. Peplar, manager; W. D. Bennett, assistant manager; and B. J. McColl, mechanical engineer.

At the Ohio Section TAPPI meeting were: Left to right—Dr. E. F. Parmenter, research chemist, Champion Paper and Fibre Co.; H. W. Laymon, technical director, Mead Corp.; Don Goodman, asst. technical director, Sorg Paper Co.; C. E. Brandon, chemist, Aetna Paper Co. Div., Howard Paper Mills; and M. G. Lyon, research chemist, Champion Paper and Fibre Co.

Testing Methods Discussed At Ohio Section of TAPPI

▶▶▶ Pulp testing procedures was subject of the panel discussion of the March 14 meeting of the Ohio Section of TAPPI held at the Manchester Hotel, Middletown, Ohio. After a short business meeting with chairman Arthur Thurn presiding, the panel was introduced by M. G. Lyon of The Champion Paper and Fibre Co. The panel consisted of C. E. Brandon, Aetna Paper Co., moderator; Howard Laymon, The Mead Corp.; E. F. Parmenter, The Champion Paper and Fibre Co., and Don Goodman, Sorg Paper Co.

On pulp strength testing, Mr. Laymon discussed the meaning of pulp strength from the viewpoint of a manufacturer as well as a buyer of pulp. He also covered methods of making test sheets and methods of refining including the rapid refining method used at The Mead Corp.

Dr. E. F. Parmenter in his discussion on chemical tests on pulps pointed out that these tests were of very limited practical value in the prediction of papermaking qualities. In special cases, chemical tests have definite value. Dr. Parmenter discussed these tests and their significance.

Don Goodman enumerated several tests for pulp examination or inspection in addition to physical and chemical tests. These included spectral reflectance, brightness, dirt in pulp, fiber classification and microscopic examination.

During the question and answer session which followed, there was considerable discussion in regards to the disc refiner used by The Mead Corp. for pulp strength testing. The charge of pulp is 80 grams B.D. at 2 per cent consistency and the time elapse is 20 seconds. Freeness reduction on sulphite pulp is about 130 cc.

After the question and answer period, a motion picture was shown, "Trees to Tribune," which covered the operations of logging, paper manufacture and shipping and handling the finished newsprint for the *Chicago Tribune*. Also covered in the film were the operations necessary during the printing of the paper.

Following a discussion of personnel problems at the Michigan Div. of the Superintendents Association, are (L to R): (1) Robert A. Huston, industrial relations mgr., KVP, who introduced the speaker (2) John C. Simonich, director of industrial relations for Kimberly-Clark Corp., guest speaker, and (3) Wm. F. Hathaway, KVP technical superintendent and Division chairman, who presided at the meeting

Policies Governing Personnel Subject of Mich. Supts. Meeting

▶▶▶ Personnel responsibility must not rest upon the shoulders of one level of management, but must be accepted and its responsibilities met by all levels of workers, said John C. Simonich, director of industrial relations, Kimberly-Clark Corp., Neenah, Wis., in an address given before more than 100 paper mill men at the last monthly meeting of the Michigan division of the American Pulp and Paper Mill Superintendents Association held at the Hotel Harris, Kalamazoo, Mich.

Mr. Simonich, who was introduced by Robert A. Huston, manager of industrial relations of Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich., in the meeting in which William F. Hathaway, of KVP's laboratories, presided, went on to emphasize that while all management levels have personnel responsibilities, each has a definite area of operation and decision.

Top management must accept the responsibility of fixing its policy concerning wage and hourly employees as well as with the other management and supervision levels of the organization. Additionally, top management must determine company policy regarding relations with stockholders, the public, and the government.

Other responsibilities of top management include basic attitudes towards employees, matters of union representation and bargaining, types of benefit items available and the basic security of jobs and income through long range policies in research and product development.

Once such policies are decided upon by the top management, continued Mr. Simonich, it is the responsibility of the operating management to put into effect the decisions of top management. Complete familiarity with the aims to be accomplished is a necessary tool of the supervisory staff, as are the existence of means whereby supervisors can let workers know of the policies being followed.

Mr. Simonich concluded his talk by commenting that the staff management, including industrial relations and plant personnel departments, is the final link in the chain of good management. This level of management executes the programs planned and has the duty of formulating objectives, programs, and procedures for approval by higher officials.

Mr. Huston served as moderator for the general discussion held following Mr. Simonich's address.

Amos Advanced to Asst. Executive Secretary of the APPA

E. G. Amos, a member of the American Paper and Pulp Association staff in charge of industrial relations for the past nine years, became assistant executive secretary of the Association on April 1.

Mr. Amos was for fifteen years engaged in agricultural extension work for Michigan State College after graduation from the school. He also spent eight years in the service of the U. S. Forest Service at Milwaukee and Boston.

Since joining the APPA staff in 1941 Mr. Amos has been secretary of the Association's Industrial Relations Committee, director of the annual convention, and for the past four years, secretary of SAPI.

James Fish Resigns as First Vice Pres. of Superintendents Ass'n

The resignation of James Fish from the office of first vice president of the American Pulp and Paper Mill Superintendents Association has been announced by Charles H. Reese, Association president.

Mr. Fish is a paper mill consultant (Irving, Mass.), and these duties will occupy his full time.

Coming Events

April 24-27—Nineteenth National Packaging Exposition, at Navy Pier, Chicago.

May 11-13—Annual meeting of Pacific Coast Branch, Technical Section of CPPA, at Seattle, Wash., with Pacific Coast Division of TAPPI and the Superintendents Association.

May 29-30—Joint meeting of TAPPI with the Technical Section of CPPA; fundamental research conference at Chateau Frontenac Hotel, Quebec. CPPA Technical Section Summer Meeting to be held at the Chateau Frontenac, May 31-June 2.

June 8-10—Annual meeting of the Superintendents Association, Edgewater Beach Hotel, Chicago.

June 8-10—Regional meeting, American Institute of Chemical Engineers, to be held at the Statler Hotel, Boston, Mass.

June 19-22—1950 Chemical Conference, Chemical Institute of Canada, at the Royal York Hotel, Toronto.

June 23-24—Joint Meeting of New England and Maine-New Hampshire sections of TAPPI, at Wentworth-by-the-Sea, N.H. Headquarters will be announced later.

Aug. 7-20—First United States International Trade Fair, to be held in Chicago.

Sept. 5-9—Sixth National Chemical Exposition by Chicago Section of the American Chemical Society, at the Chicago Coliseum.

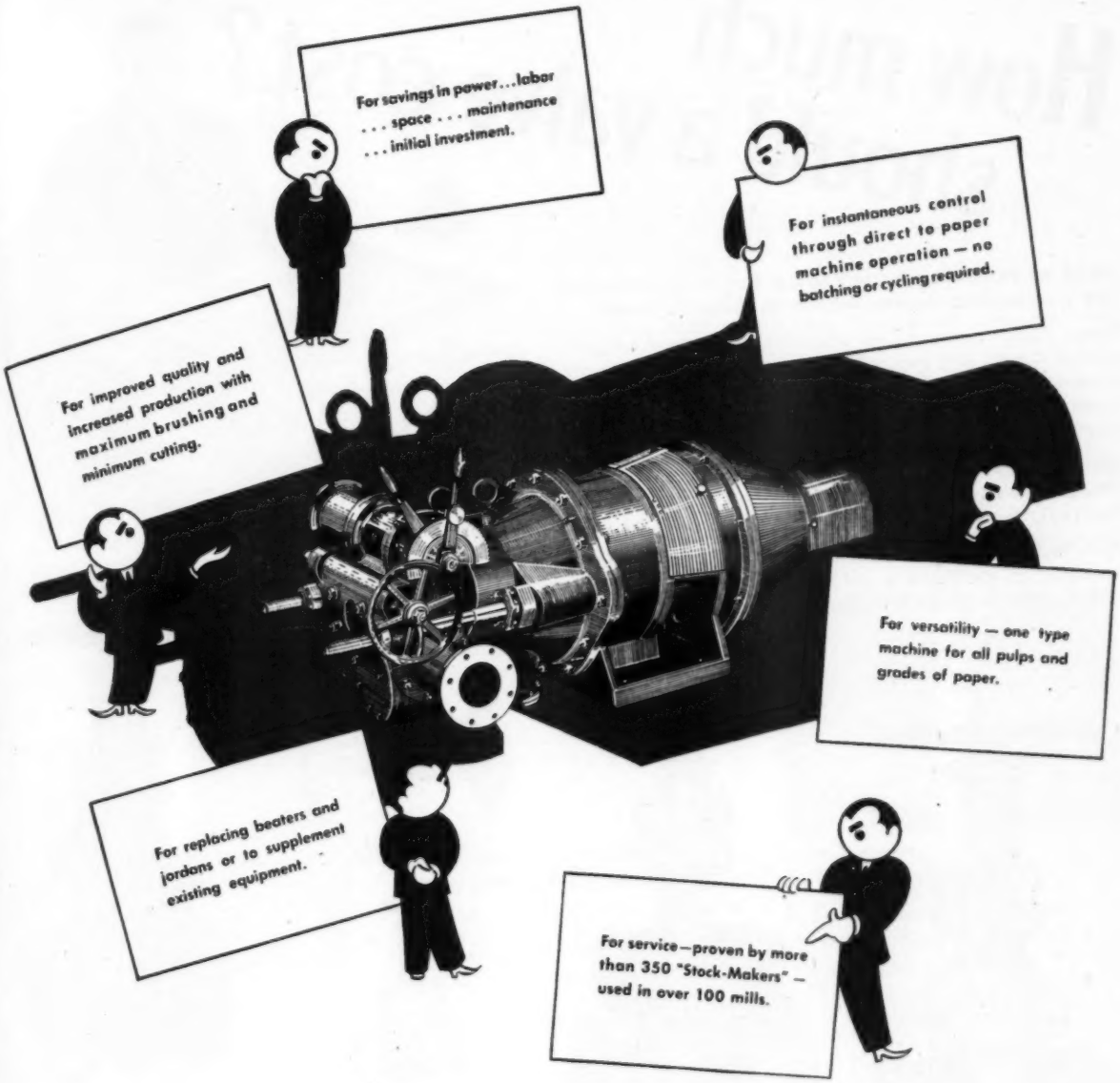
Sept. 6-8—Second TAPPI Testing Division Conference, to be held at Eastman Kodak Co. plant, Rochester, N.Y.

Sept. 15-16—Annual Fall Meeting of Northwestern Division of the Superintendents Association, at the Schroeder Hotel, Milwaukee, Wis.

Sept. 18-22—Fifth annual Instrument Conference and exhibit, sponsored by Instrument Society of America, Memorial Auditorium, Buffalo, N.Y.

Oct. 2-5—Fifth annual TAPPI Engineering Conference, Netherlands Plaza Hotel, Cincinnati, O.

Oct. 16-20—38th Annual Congress and Exposition of the National Safety Council, Stevens Hotel, Chicago.


For savings in power...labor ... space ... maintenance ... initial investment.
For instantaneous control through direct to paper machine operation — no batching or cycling required.
For improved quality and increased production with maximum brushing and minimum cutting.
For versatility — one type machine for all pulps and grades of paper.
For replacing beaters and jordans or to supplement existing equipment.
For service—proven by more than 350 "Stock-Makers" — used in over 100 mills.

Any way you look at it!

The Morden "Stock-Maker" is superior for Beating and Refining

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How much should a valve cost?

Only as much as is necessary for it to meet all the conditions under which it must operate.

When the service in which a valve is to be used requires special design and materials, it is poor economy to try to make an inexpensive valve do the job. "Down time", maintenance costs, if not actual valve failure, will far more than offset any initial saving.

On the other hand, in a majority of services, standard Powell Valves satisfy all requirements for long, trouble-free performance.

And, because Powell makes all kinds*, it is the soundest economy to standardize on Powell Valves for all your flow control requirements.

Fig. 2051—150-pound Stainless Steel "Y" Valve with flanged ends, bolted flanged yoke and outside screw rising stem.

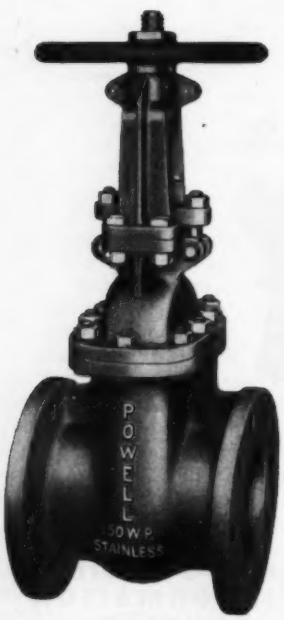

Fig. 2453-G—Large 150-pound Stainless Steel Gate Valve with bolted flanged yoke-bonnet, outside screw rising stem and tapered solid wedge. Made in sizes 5" to 30", inclusive.

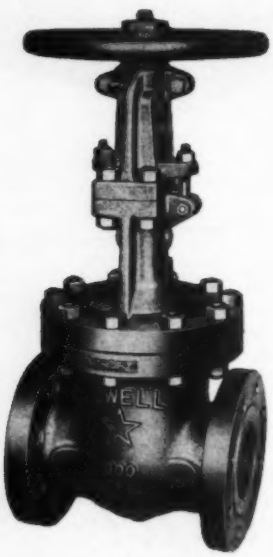

Fig. 3003—Class 300-pound Cast Steel Gate Valve with flanged ends, bolted flanged yoke, outside screw rising stem, tapered solid wedge.

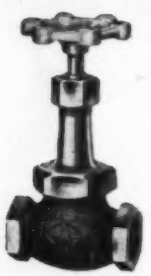

Fig. 1708—200-pound Bronze Globe Valve with screwed ends, union bonnet, renewable, specially heat treated stainless steel seat and regrindable, renewable, wear-resisting "Powellium" nickel-bronze disc.

Fig. 1793 — Large 125-pound Iron Body Bronze Mounted Gate Valve. Sizes 2" to 30", incl. Has outside screw rising stem, bolted flanged yoke and tapered solid wedge.

***The Complete Powell Line includes Globe, Angle, "Y", Gate, Check, Non-return, Relief and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-resistant metals and alloys.**

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The Paper Industry Names in the News

Lee F. Bunde Is Now Chief Engineer Of Sutherland Paper Co.

Filling the post of chief engineer at Sutherland Paper Co., Kalamazoo, Mich., left vacant with the recent death of Merton Fogerty (cf. P.I., Mar., 1950) is Lee F. Bunde. Mr. Bunde, a graduate of the Armour Institute of Technology and Tri-State College, joined the Sutherland organization in 1948 to do lay-out work for several mechanical additions to the plant.

Mr. Bunde, who has 27 years' experience in engineering in the pulp and paper industries, had in the past been associated with Celotex Corp., Marrero, La.; Filer Fiber Co., Filer City, Mich.; Otsego Falls Paper Mills, Inc., Otsego, Mich., in engineering and superintendent's postions.

Lee F. Bunde

George Mintz

M. P. Schweitzer Will Head New Dept.—Mintz Made Mgr. Smith Div.

A new department has been announced by Peter J. Schweitzer, Inc., New York City, which will make available to a number of industries, including the paper industry, facilities of the largest combined specialized paper laboratories in this country. In making this announcement, Louis P. Schweitzer, company president, said the department was a result of pooling and amplifying laboratory facilities and research staffs of his company and of its recently acquired subsidiary, the Smith Paper Co., Lee, Mass. (P.I., Jan., 1950).

Head of this new department will be M. Peter Schweitzer, secretary-treasurer of Peter J. Schweitzer, Inc., with headquarters in the Chrysler Building, New York City.

Simultaneous with the announcement of the new department, it was disclosed that George Mintz has been named general manager of the Smith Paper Division, succeeding Walter Tatum, manager for the past nine years. Mr. Tatum has resigned to return to Brown & Williamson Tobacco Co., Smith's former owners.

Strathmore Paper Co. Promotes Shattuck

The recent appointment of Laurence W. Shattuck as general superintendent of the West Springfield and Woronoco, Mass., plants of the Strathmore Paper Co. advances his position from that of assistant to the vice president in charge of production.

Mr. Shattuck joined Strathmore in 1913, and served in various positions in several departments of both the West Springfield and Woronoco mills; prior to the assistantship he is leaving he was superintendent of the Strathmore No. 1 Mill in Woronoco.

Five Changes — Gair Management Personnel

Several promotions and changes in personnel on the management level have recently been effected at Robert Gair Co., Inc., New York. Sumner R. Cahoon, former vice president in charge of container operations, has resigned that post to join the Binghamton Container Co., Inc., Binghamton, N. Y., in which he will have an interest. Mr. Cahoon will continue serving the Robert Gair Co. in an advisory capacity until Aug. 1, when he will take up his new work. William T. May, sales manager of the firm's container division, has been placed in charge of container operations.

The former division manager at the company's New London, Conn., plant, C. S. Huestis, has assumed the duties of manager of container board production for Gair's container board manufacturing plants. Mr. Huestis has been associated with the company for more than ten years.

The Thames River division of the company, at New London, Conn., has as its recently appointed manager a Gair employee with more than 16 years of service, William H. Caddoo. Mr. Caddoo was at one time technical director for the entire company, and has also served as chief of the plant laboratories at both Haverhill, Mass., and Piermont, N. Y.

John P. Greiveldinger, formerly superintendent of the company's Pennsylvania Corrugated Box plant at Philadelphia, has been made production manager for all corrugated box divisions. Mr. Greiveldinger has been with the Gair firm for eight years.

Harold A. Sholl has been appointed industry manager for the pulp and paper field for Brown Instruments Division of Minneapolis-Honeywell Regulator Co., Minneapolis.

Harold Sholl

S. K. Bradley

S. K. Bradley Promoted by Union Bag & Paper Co.

New director of multiwall bag sales for Union Bag & Paper Corp., New York, is Sydney K. Bradley, former assistant director of the department.

Mr. Bradley joined the Union Bag organization in 1938, serving as director of chain store sales and eastern district manager of multiwall bag sales previous to his most recent position. During the war, he served as a staff officer in the Headquarters Army Service Forces in Washington, D.C., with the rank of Lt. Colonel.

Edgar Brothers Co. Makes Executive and Managerial Changes

Several executive and managerial changes have recently become effective at Edgar Brothers Co., Metuchen, N.J. Alfred G. Blake has been elected vice president in charge of sales, resigning as a partner of the management consultant firm of Rogers & Slade, New York, to join Edgar Brothers.

In the same election, J. Gilbert

Mason, Jr., a board member who has been with the firm more than 30 years, was elected vice president. Concurrently, O. W. Callighan, a member of Edgar Brothers sales department for over 20 years, was promoted to manager of special accounts, and Robert V. Dilly was named manager of specialty sales and assistant secretary of the company.

Edmund Haigler Joins Fischer & Porter

A recent addition to the Fischer & Porter Co. offices in Hatboro, Pa., is Edmund D. Haigler, who will work on special customer engineering problems.

Mr. Haigler, a graduate of Harvard Engineering and Business Schools, has worked in industrial instrumentation for the past 20 years; his former associations include the Chevrolet Division of General Motors, E. I. duPont de Nemours & Co., Inc., and the Foxboro Co., where he acted as manager of the engineering department.

A contributor to technical journals and engineering handbooks Mr. Haig ler, who is a member of numerous technical associations, was a part of the four-man instrument team which studied German industry for the U. S. Government in 1945.

Edmund D. Haigler

Dr. J. R. Sanborn

Dr. J. R. Sanborn Joins National Aluminate

A former professor of microbiology at Syracuse University, Dr. J. Raymond Sanborn, was named technical director of the pulp and paper division of National Aluminate Corporation of Chicago on Feb. 13.

Dr. Sanborn, who has for several years been serving as a consultant on microbiological control to paper manufacturers in addition to his university position, is the author of more than 50 articles published in leading scientific and industrial periodicals. For the 14 years preceding 1946 Dr. Sanborn was occupied with paper and paperboard research projects for International Paper Co. and New York State Experiment Station of Cornell University. Among the several associations in which Dr. Sanborn holds memberships are TAPPI and the Society of American Bacteriologists.

In his new position, Dr. Sanborn will work with H. E. Berg of National Aluminate's Pulp and Paper Division in assisting the firm's field force to plan and establish complete microbiological control programs for pulp and paper mills.

Ray Vechinsky, a veteran of over 20 years' experience in the paper industry, was recently appointed superintendent of the Port Edwards mill of Nekoosa-Edwards Paper Co., Port Edwards, Wis. Mr. Vechinsky had formerly served as assistant superintendent, and following the retirement of L. C. Meyer in 1949, as acting superintendent.

Hercules Powder Co. Promotes Two— Jones and Bertram

Two executives of the Virginia Cellulose plant of Hercules Powder Co. at Hopewell, Va., have been promoted. E. Langford Jones, formerly chief chemist, has been named technical assistant in sales for Virginia Cellulose Department in Wilmington, Dela. Mr. Jones, a graduate of William and Mary College, first joined Hercules in 1939 as a chemist at the Hopewell plant, becoming operating supervisor in 1946 and chief chemist in 1948. As chief chemist he supervised the development of new techniques in the preparation and use of chemical cotton used in the manufacture of rayon, paper, plastic, tire cord and other products.

Succeeding Mr. Jones as chief chemist is Leon L. Bertram, former supervisor of the development group at the Hopewell plant. Mr. Bertram, a graduate of Pennsylvania State College, joined Hercules in 1941 and was named Hopewell development supervisor in 1946.

Richard L. Huber has been appointed to the product promotion and market development division of the Cellulose Products Department of Hercules Powder Co., Wilmington, Dela. *Frank Ketchum,* formerly of the Detroit office of the firm, succeeds Mr. Huber as sales representative of the Cleveland area.

Keith Roberts, formerly on the staffs of both a radio station and a newspaper at Madison, Wis., has joined the personnel administration department of Nekoosa-Edwards Paper Co., Port Edwards, Wis. Mr. Roberts will be concerned with safety promotion and employee relations.

Another Morse Heads F-M

When Robert H. Morse, Jr., became president of Fairbanks, Morse & Co., Chicago, on March 22, he became the third generation of his family to hold that office. Like his father, Col. Robert H. Morse, the new president began his career with the company in the foundry of the Beloit, Wis., plant, and held positions of increasing importance, including the offices of assistant general sales manager, and vice president in charge of sales, serving most recently as vice president in charge of operations.

Col. Robert H. Morse, who became chairman of the board when his son was elected president of the firm, has had 55 years service with Fairbanks Morse, and has been president of the company since 1931.

The company was formed by Charles Homer Morse, who in 1847 bound himself out for $50 a year to learn the scale business with the firm which later became the present company.

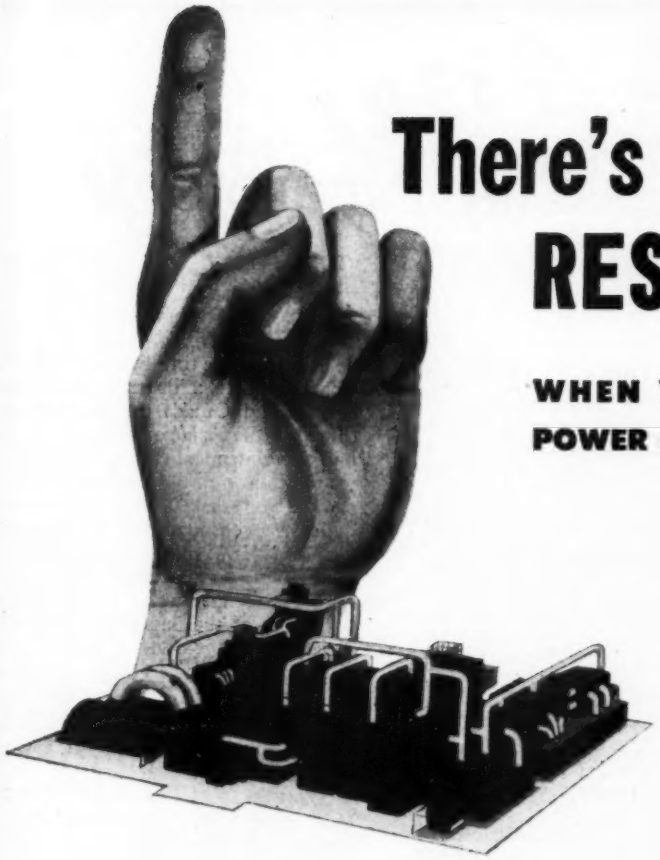
Robt. H. Morse, Jr.

George D. Butler

George D. Butler, formerly a physicist in instrumentation research for Calco Chemical division of American Cyanamid Co., Chicago, has joined the New York staff of National Technical Laboratories. In his former associations with American Cyanamid, Carl L. Norden Co., and Bendix Aviation, Mr. Butler had considerable experience in the development and use of *p*H meters, spectrophotometers and related scientific instruments.

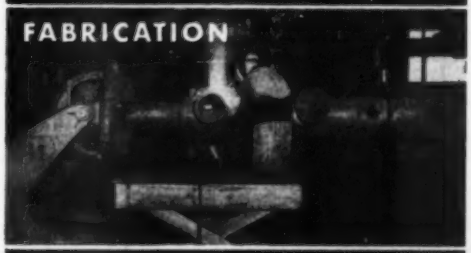
J. S. Scheurmann and *T. N. Carter,* both formerly of Cameron Machine Co., Brooklyn, N.Y., have become associated with Bagley & Sewell Co., Watertown, N.Y. In announcing the appointments, Abe Cooper, president of the company, disclosed that Mr. Scheurmann and Mr. Carter will be in charge of development and sales of the firm's slitting, winding, laminating and converting machinery division.

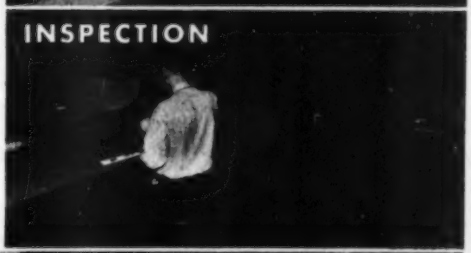
George V. Johnson, secretary of Elof Hansson, Inc., has been elected president of the United States Paper Exporters Council, succeeding Kenneth

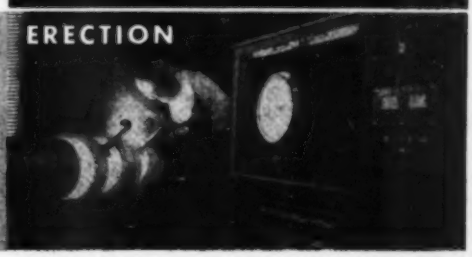


There's Only 1 RESPONSIBILITY

WHEN YOU TURN THE COMPLETE POWER PIPING JOB OVER TO P. P. & E.







Simplify responsibility on your next power piping installation—entrust the complete job to P.P.&E. These are a few of the advantages:

- Far less detail work for you.
- Correct interpretation of blueprints.
- Efficient detailing of shopwork for best coordination with field requirements.
- Maximum amount of system prefabricated, stress-relieved, model tested, as well as tested under ideal shop conditions.
- Field erection supervised by specially-trained personnel with a minimum of waste motion.

All these responsibilities—and many others—are made into one . . . *ours* . . . when the *complete* high pressure piping contract is turned over to us. Consult our nearest representative for futher information.

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Whitehead Building, Atlanta
Book Tower, Detroit
525 Market Street, San Francisco
Peoples Gas Building, Chicago
Public Square Building, Cleveland
10 High Street, Boston
Heights State Bank Bldg., Houston

W. Latham, of Moller & Rothe, Inc. Prior to World War II, Mr. Johnson was assistant to M. C. Dobrow, executive secretary of the Writing Paper Manufacturers Association, but left that organization to accept a commission in the Navy. At the close of the war, he went with the Hansson organization.

Juan P. Bosch, formerly associated with Bulkley Dunton Paper Co., S. A., recently accepted a promotional position with Butler Co., New York. Mr. Bosch, who has worked extensively in the paper export trade in South America, will be concerned with the sale of Butler papers in export markets.

LeRoy J. Bauer is the latest of several engineers sent to augment the staff of The Black-Clawson Co. London subsidiary, B-C International. Mr. Bauer, who will act as a consultant on stock preparatory equipment, had lately been working in the Black-Clawson Middletown, Ohio, export department, after 12 years service with the company.

Henry B. McAllister, former superintendent of the paper mill of Central Paper Co., has been advanced to the position of general superintendent of the mill. Mr. McAllister was for 20 years associated with various mills of International Paper Co. before joining Central Paper Co.

Chatten Haynes, formerly assistant mill manager of the International Paper Co. Southern Kraft Division at Camden, Ark., has been named acting manager of the company's plant at Moss Point, Miss., Southern Kraft Division. Mr. Haynes, a native of Camden, Ark., has been associated with the Southern Kraft mills since his graduation from the University of Arkansas in 1933.

Edgar F. Guillot has been appointed assistant sales manager of Filtration Engineers, Inc., Newark, N. J. Mr. Guillot, a graduate of Union College, was employed by Johnson and Johnson, the Carborundum Co., and the Dunlop Tire and Rubber Co. before becoming associated with Filtration Engineers in 1945.

A. C. Ewer, manager of the Brooklyn, N.Y., plant of Bemis Brothers Bag Co., St. Louis, recently celebrated his golden anniversary with the company, a service span achieved three years ago by his brother, F. M. Ewer, manager of the company's Boston office and a vice president and director of the firm.

The Paper Industry Necrology

Killey E. Terry

Well known in the industry and its affiliated groups, Killey E. Terry, a director of the S. D. Warren Co., Cumberland Mills, Maine, passed away April 1.

Mr. Terry was born in New Bedford, Mass., in May, 1883. He graduated from MIT in 1906 and joined the staff of the S. D. Warren organization four years later. He remained with that company throughout his career.

For a number of years he served as chief engineer. About a year ago, he was made director of engineering.

He was a member of the American Society of Mechanical Engineers, the Technical Association of the Pulp and Paper Industry, and The American Pulp and Paper Mill Superintendents Association, Inc. Mr. Terry served as president of the Superintendents Association for the year 1934-1935, and was one of the Association's trustees for a number of years.

No close relatives survive Mr. Terry; his wife passed away in 1948.

Killey E. Terry

Peter Denner

Peter F. Denner

A veteran papermaker of the Kalamazoo Valley, Peter F. Denner, passed away March 6 at Kalamazoo, Mich., at the age of 71.

Mr. Denner began his papermaking career as a very young man, becoming associated with Riverview Paper Co., predecessor of Kalamazoo Paper Co., in 1901, after having been employed in a Des Plaines, Ill., mill. After some time, Mr. Denner, whose specialty was coatings, attained the position of superintendent of the Riverview Co. which he held for some time before leaving to work in other mills throughout this country and Canada. In 1917 he returned to the Kalamazoo Paper Co. as mill superintendent, a position he held for the following 25 years. Eight years ago he left that position to assume duties as a consultant for St. Regis Paper Co., New York, a position he retained until his retirement three years ago. Mr. Denner was for many years a member of the Superintendents Association.

The widow and seven children survive.

John Long

The passing of John E. Long, a former president of the National Safety Council, on February 4 was a real loss to the cause of national safety.

Mr. Long served two terms as president of the National Safety Council. He had been connected actively with the work of that body since 1928, and served in several official posts before elected to head the Council in 1933. During World War I, Mr. Long had been safety engineer for the Canadian National Railways. After that war, he took over the position as superintendent of safety for the Delaware & Hudson Railroad Corp., and continued this work until his passing.

It became an annual custom for Mr. Long to act for the National Safety Council in the presentation of its trophies awarded within the Pulp and Paper Section, and he made many warm friendships among members of the Section through his interest in this work.

Arthur E. Gibbs, inventor and developer of the Gibbs cell for the electrolytic production of chlorine, caustic soda and hydrogen from common salt brine, passed away March 2 at Summerville, S. C. Mr. Gibbs was 74 years of age.

Francis E. Gallagher, vice president of the John A. Manning Paper Co., Troy, N. Y., passed away March 23 in Florida.

UP GOES SPEED DOWN GOES COST

with INLET
and HEADBOX by VALLEY

AND NOW
On more and more
paper machines it's
Inlet and Headbox by
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This giant weighing 60 tons and standing 18 feet high and 20 feet across is another outstanding example of headbox and inlet by Valley, on Southern Kraft. Regardless of size, all standard VALLEY STOCK ENTRANCE EQUIPMENT contains satin-smooth stainless steel or monel interior with a glossy rust-preventative, baked-on Lithcote exterior. VALLEY STOCK ENTRANCE EQUIPMENT is designed to make QUALITY papers at QUANTITY speeds.

VALLEY IRON WORKS CO., Appleton, Wis.

FORMATION CALIPER LEVEL SHEET INCREASED SPEED HIGHER TEST

The Paper Industry Allied News

Kennedy Valve Mfg. Co. Purchases Semler Co.

Purchase of the Semler Co., Jeannette, Pa., by Kennedy Valve Manufacturing Co., Elmira, N.Y., was completed recently. Manufacturing operations will be continued at the plant, for which future plans and purchase price were not disclosed.

New officers of the Semler Co., manufacturers of cast-iron pipe fittings, include Charles F. Kennedy, president; J. Lawrence Kennedy and Howard P. Semler, vice presidents; and Thomas S. Turkington, controller.

OFFICES HAVE BEEN established at 50 East 41st St., New York, for Bjorksten Research Laboratories, Inc., specialists in technical development work. The laboratories, which have worked co-operatively with the paper industry on coatings and sizing applications entailing the use of plastics, will remain under present direction, Dr. Edwin L. Gustus, vice president, continuing leadership of the Chicago offices, and Dr. Johan Bjorksten, president, dividing his time between the New York and Madison, Wis., offices.

Hyster Co. Acquires New Line of Trucks

The manufacture and sale of Turret Trucks formerly produced by Salsbury Corp., Los Angeles, has been taken over by Hyster Co., Portland, Ore. Acquisition of the five Salsbury horizontal materials handling trucks rounds out the previous Hyster industrial truck line consisting of four fork lift trucks of varied capacity, a 10,000 pound mobile crane, and two straddle trucks.

The new line, now manufactured at Hyster's Danville, Ill., plant, will be known as Hyster Salsbury Turret Trucks, and will be sold and serviced by the firm's 168 distributors located in principal cities throughout the world.

Buffalo Pumps, Inc. Forms New P & P Div.

A pulp and paper division has been formed by Buffalo Pumps, Inc., Buffalo, N.Y., and its subsidiary company, Buffalo Forge Co., to better serve the industry by integrating the engineering and application problems of liquid and air handling.

John B. Chandler

Managing the new division will be John B. Chandler, a graduate of Bowdoin College, who was formerly in charge of pulp and paper engineering for the Bristol Co., Waterbury, Conn., where he was employed for six years. Mr. Chandler has also worked for a number of years in engineering and operation in several pulp and paper mills.

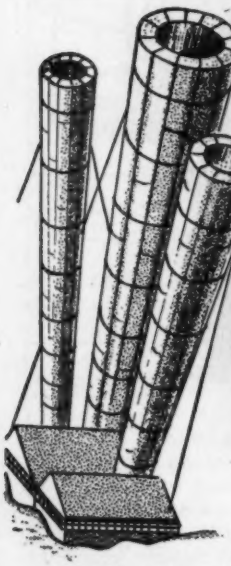
COINCIDENT WITH ITS 80th anniversary of business operation, the F. A. Ringler Co. is moving to new and larger quarters at 418 West 25th St., New York. The move is being made to allow sales and show rooms to be housed in the same building with the electrotype printing plate plant of the firm.

Du Pont Establishes New Department

A new department to be responsible for research, production and sales for all products currently handled by the Cellophane division of E. I. du Pont de Nemours & Co. Rayon Department has been established. The new organization, to be known as the Film Department, will have as general manager Donald F. Carpenter, former chairman of the National Munitions Board and employee of Du Pont since 1922.

The new department, which began operations April 1, was created because the business of the Cellophane Division has so expanded since the war as to justify the organization of a separate department.

AN EXPANSION PROGRAM planned for the Escanaba, Mich., plant of The Harnischfeger Corp. is expected to cost about $500,000. Three new bays, 50 x 100 feet, will be added to the firm's truck crane plant by July 1.



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RED CYPRESS

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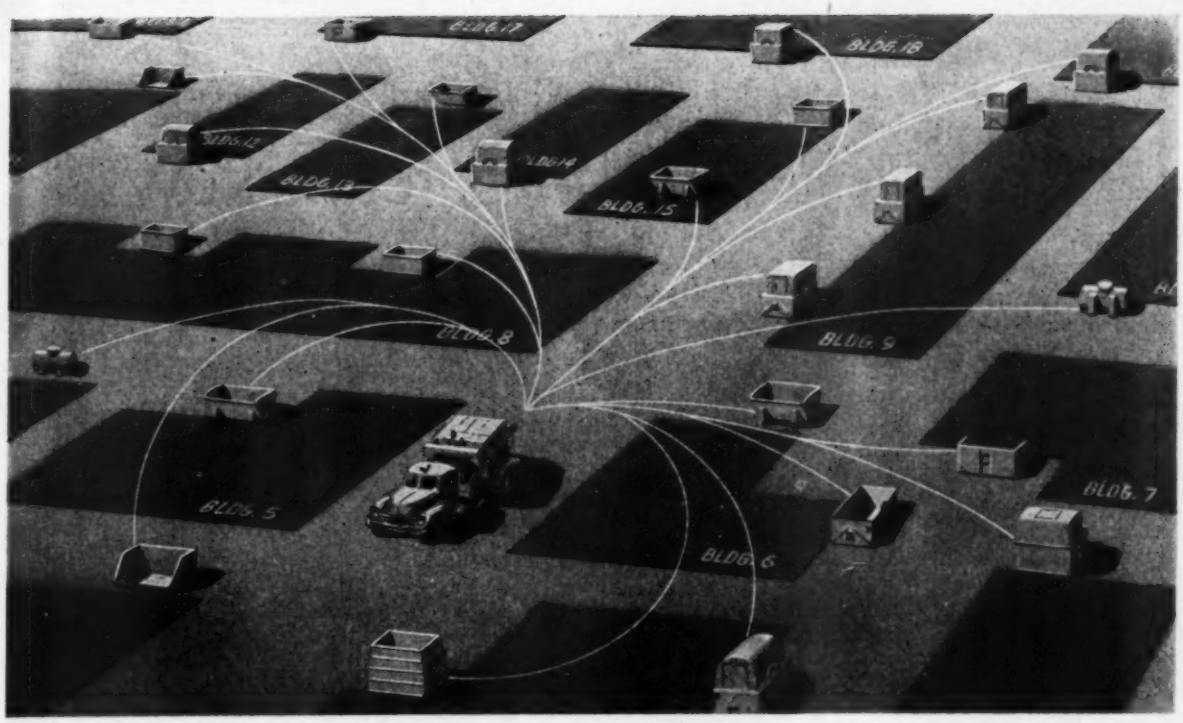


★ Never Before Have You Been Able To Cut Bulk Materials Handling Costs So Drastically

Pictured above is a skeleton layout of a typical industrial plant using the Dempster-Dumpster System — one truck mounted Dempster-Dumpster handles the entire group of 26 Dempster-Dumpster containers of six different types. These big, detachable steel containers are like having 26 truck bodies for a single truck.

Any required number of Dempster-Dumpster containers are spotted at convenient materials accumulation points inside and outside your plant. They range in sizes up to 10 cu. yds. and are made in various designs to suit your particular needs. Materials — bulky, light, heavy, solids, rubbish and even liquids—are dumped or placed in these containers. The truck mounted Dempster-Dumpster makes scheduled rounds, picks up each preloaded container, carries it to the point of disposal, sets it down intact or dumps the materials and returns the container for refilling. The entire operation is hydraulically controlled and handled by only one man, the driver.

It is not unusual for one Dempster-Dumpster to eliminate up to 10 conventional trucks . . . reducing investment accordingly. This means cutting maintenance costs, tire and gas requirements tremendously. And, more important, it increases production with a minimum of manpower. It will pay you to investigate the Dempster-Dumpster System now! A product of Dempster Brothers, Inc.

Above, the Dempster-Dumpster is shown in the three simple stages of picking-up, hauling and dumping an 8 cu. yd. drop bottom container . . . completing the cycle in one to two minutes. These photos show the ease with which the Dempster-Dumpster handles all containers, regardless of their type, size or whether they are bottom or tilt dumping types.

The important feature to remember is that only one truck-mounted Dempster-Dumpster and driver handles one container after another in an endless cycle, constantly on the move for economy and efficiency never before available in bulk materials handling.

DEMPSTER BROTHERS, 740 Dempster Bldg., Knoxville 17, Tenn.

The Paper Industry Safety News

First Month of 1950 Contest Shows 227 Perfect Scores

The new 1950 Calendar Year Paper Industry Safety Contest was off to a good start at the end of the first month. Participants reporting for January totaled 374 (including 9 with below minimum exposure). This represented an increase of 18 over the number that finished the 1949 contest.

Of the 374 contestants, 227 (including 9 with below minimum exposure) or three out of every five, worked the entire month of January without having any reportable injuries. Of the 250 mills in Division I, 142 had perfect records, and 85 of the 124 remanufacturing plants in Division II also accomplished this objective.

ONE OF THIRTY Massachusetts publications to receive a merit award in the annual contest of the Massachusetts Industrial Editors' Association was the *Bird Neponset Review*, published by Bird & Son, Inc., for its workers. The award certificate was presented recently at an Association meeting in Boston for the firm's Annual Report issue of March, 1949.

AWARDS WERE WON BY International Paper Co. and Kimberly-Clark Corp., both of Niagara Falls, N.Y., in the recent safety campaign sponsored by Associated Industries of New York State.

N.S.C. Offers New Safety Training Film

The National Safety Council is offering an emotion-packed safety training film which dramatically emphasizes the desirability of wearing safety glasses in certain jobs. To illustrate the theme of "wear the right safety glasses, make sure they fit, and keep them clean," the film portrays case histories of injured and blind workers who would yet have their sight if they had but followed the film's suggestions.

Available in 35 mm sound slide film or in a new form for 16 mm sound-motion projectors, the film is titled "Easy on the Eyes," and utilizes motion pictures, still photos and unusual optical effects to make possible a production similar to the motion picture in effectiveness at about one-third the cost of a comparable movie.

Without an accident for 2615 days . . .

This group of employees of the bleach and bleach liquor departments of the Wausau Paper Mills Co., Brokaw, Wis., had completed 2615 days without a lost-time accident at the time this picture was taken (March 23). This marked the second time any department of the mill had passed the 2500-day safety mark. Members of the department are: (kneeling, L to R) Lawrence Schultz, Wm. Josiger, James Case, Joseph Niklas, Robert Zweck, and Al Scholl; (standing, same order) Wm. Bresnahan, Leonard Czaplinski, Alvin Sowinski, Ralph Kohnhorst, Leon White, Earl Fleishman, Einar Gisselman, Arthur Duranceau, and Harry Halder. Mr. Gisselman is sulphite superintendent. Mr. Duranceau and Mr. Hanke are night superintendents, and Mr. Halder is the mill's safety director

National Safety Council Is Moving

After being in one location for about twenty years, the National Safety Council, Chicago, will move on May 1 from 20 North Wacker Drive to 425 North Michigan Ave., Chicago 11.

It is understandable, of course, that such a move will be a big project. The Council states, however, that although there will, naturally, be some disruption of routine operations and all people having contacts or business with the Council this will be worked out during the months of April and May. Regarding poster service, the Council has issued the following notice:

Automatic poster services and monthly commercial vehicle materials which would normally be shipped from April 15 to 25, probably will go out April 1 to 10 and be received early. May shipments of these items may be a little late.

The processing of orders for selected posters and other materials will be slowed up appreciably for about a two-week period at the end of April and the beginning of May.

After the NSC offices are settled in the new location, the Council looks forward to giving better service and cooperation in handling all of its business.

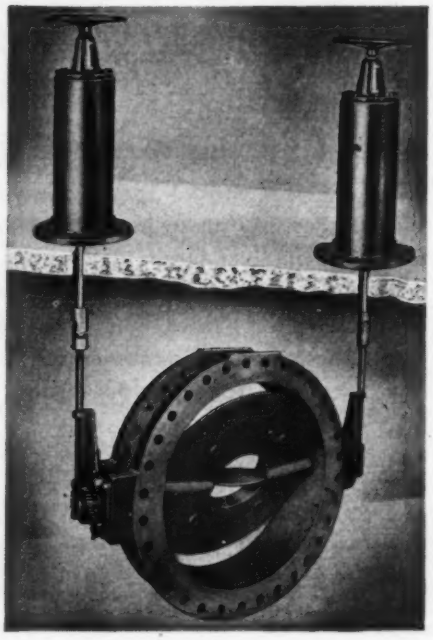
Prominent Leaders Speak At Southern Safety Ass'n Conference

The pulp and paper section of the Southern Safety Association drew 105 persons to its two afternoon sessions during the Southern Safety Conference and Exposition which met in Memphis, Tenn., March 5-7.

E. P. Marconi, staff representative of the Pulp and Paper Section of the National Safety Council, spoke at the Monday afternoon session on the sub-

R-S valvEvents

• EXCERPTS FROM THE R-S BOOK OF EXPERIENCE •



No. 727

36 inch x 8 inch heavy duty dual valve with 125-pound Am. Std. flanges controls maximum flow with a small pressure drop in large 36-inch valve. By closing large valve, small inner 8-inch valve controls small flow with high pressure drop. Separate handwheel controls for each valve vane patented. Automatic control and drip tight rubber seat available.

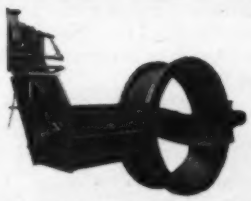
7 Advantages of R-S VALVES

1. Economy in first cost. Minimum number of working parts.
2. Body assemblies correctly engineered mechanically and metallurgically. Equal or exceed A.S.A. standards in every detail.
3. Only a few handwheel turns required for opening or closing.
4. Less inherent pressure loss reduces pumping costs.
5. More control rangeability. Readily adapted to automatic operation.
6. Self-cleaning—no pockets to capture sediment—no objectionable turbulence or wire drawing.
7. Rotary motion of shaft reduces stuffing box problems.

R-S PRODUCTS CORPORATION
Wayne Junction • Philadelphia 44, Pa.

No. 680—Standard heavy duty valve with handwheel control—self-locking worm and gear. Automatic control and rubber seat available with 125-pound flanges. Rubber seated valves are drip tight with water at 100 psig and air bubble tight at 80 psig under temperatures up to plus 275° F. and as low as minus 40° F.

No. 771—Heavy duty wafer type valve equipped with handwheel control—self-locking worm and gear. One-piece body casting. Vane, shaft assembly and handwheel control identical with double flanged valve. Face-to-face dimension does not reduce torque. Flareout on body casting accommodates large mounting bracket base same as No. 680.



No. 734—72 inch 125 pound "H" metal valve for 800° F. Equipped with cooling fins, oil cylinder and positioner utilizing 200 psig operating oil pressure and 0-15 psig instrument air. Positioner cam driven simulating straight-line semi-log control curve or other characteristics if desired.

R-S field representatives maintain experienced engineering and maintenance staffs to study your valve problems, make recommendations and an appraisal of what you may expect from such studies. Specially trained factory representatives are also available for consultation.
Consult with your local R-S representative. Look for the address and phone number listed under "R-S Products, Valves" or write direct.

Hold Everything!

for every three workers injured on-the-job last year, four were hurt off-the-job

Cartoon-illustrated HOLD EVERYTHING is a sparkling little booklet that covers all these major traffic, pedestrian, and home accidents . . . and at a rock bottom cost. HOLD EVERYTHING costs only a few cents a copy.

HOLD EVERYTHING drives home a serious message . . . with a smile. Takes over where your plant program leaves off. This colorful off-the-job booklet speaks for you . . . with suggestions on swimming, sun-tanning, and just plain "car sense." There is a handy home check list to make those stay at home "vacations" a lot safer. Cut down vacation lost time by ordering copies for each of your workers. Send in your order, today.

QUANTITY PRICES	1 to 9	10 to 99	100 to 999	1000 or more
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NATIONAL SAFETY COUNCIL
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ject "Promoting Interest in Accident Prevention and Health through the Use of Visual Aids." Another speaker at that session was John A. Geary, educational division, Employers' Liability Assurance Corp., Ltd., Boston, who spoke on "Accident Prevention and the Industrial Supervisor."

E. G. Amos, of the American Paper and Pulp Association, outlined "The Joint Safety Effort of the APPA and the Superintendents Association. E. V. Johnson, staff safety supervisor of Kimberly-Clark Corp., Neenah, Wis., presented facts and demonstrations on "The Salient Points of a Safety Program." Safety films were shown at the close of each session.

Program chairman of the Section was A. D. Guentzel, personnel superintendent of the Kimberly-Clark mill in Memphis.

Marathon Celebrates Outstanding Safety Performance

The outstanding safety record of the Marathon Corp., Rothschild, Wis., was celebrated with a banquet the evening of March 21 which was attended by members of the employee and foremen safety committees, the mill's safety council, company officials and guests.

In 200 days and 1,000,000 manhours of work, no one suffered a lost-time injury. Special interest in the company's safety program was heightened when Melville Whiteside, chairman of the employees' safety committee, presented to Roy H. Kelly, resident manager of Marathon, a wooden goat wearing a worried look and labeled "Kelly's Safety Goat." The goat will keep Mr. Kelly company in his office until some department has an accident. That department will then become custodian of the goat for one month.

No One Wants This Goat!

If a department at the Marathon Corp., Rothschild, Wis., breaks its record with a lost-time accident, it must keep this goat for one month. Roy H. Kelly, company manager (shown here), was presented with the goat by the chairman of the employees' safety committee

Participating in the safety record chalked up were 870 employees of the Rothschild division including the pulp and paper division hourly and salary employees, and corporate and woodlands division office personnel. The chemical division was not included.

Speakers at the banquet included D. C. Everest, Marathon board chairman; R. J. Sund, company vice president (Menasha); and Fred W. Braun, chief engineer of the Employers Mutuals.

THE THIRD TWO WEEK SEMINAR in public utility safety, sponsored jointly by Ebasco Service, Inc., New York, and New York University, was held the weeks of March 6 and 13 at the University campus. With the purpose of teaching utility safety executives the latest developments in the field of accident prevention administration, the sessions included classroom meetings, field trips, instructional work and conferences.

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INVESTIGATE These COST-SAVING GRINDERS

Knives stay sharp longer . . . no over grinding to shorten knife life . . . no excessive outside grinding costs . . . no high knife inventory. Rogers Series 220 maintains precision cutting edges that keep production 100% efficient.

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SULPHITE MILL ACID PLANTS

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JENSSEN AUXILIARY PROCESS TOWERS
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SOLUBLE BASE ACID PLANTS
SEMI CHEMICAL PLANTS
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- √ Chip Screens
- √ Pulp Screens
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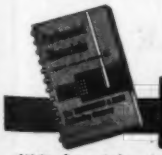
- Smooth, easy-to-clean surfaces
- Accurate and uniform hole sizes
- Standard or special perforations
- Stainless steel and corrosion resisting alloys a specialty
- Rolling, forming and other fabricating



Harrington & King Perf. Co.

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PAPER MAKERS KNOW that SOLVAY stands for chemicals of quality . . . the kind of quality that helps your plant operate more efficiently, more economically.

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THE COAST-TO-COAST chain of SOLVAY warehouses and stock points are your assurance of prompt delivery . . . and SOLVAY'S strategically located manufacturing plants guarantee a steady supply of the materials that are vital to paper production.

SOLVAY TECHNICAL SERVICE offers both laboratory and field aid by paper specialists who know paper making from A to Z.

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Caustic Soda
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Chlorine
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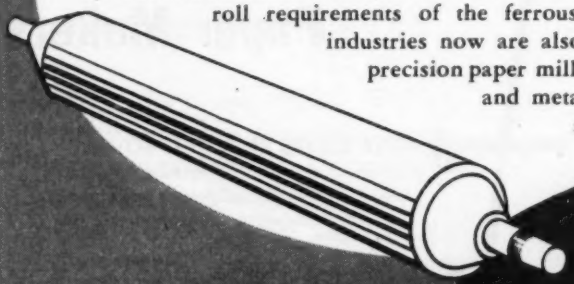

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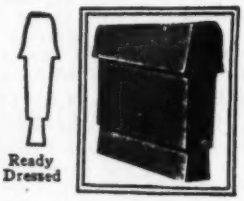

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India's Paper Industry Reviewed by Paper Mill Association President

Chief speaker at the eighth annual general meeting of the Indian Paper Mills Association held in Calcutta January 31, was Shri Nand Kishore Bajoria, association president. An abridgment of Shri Bajoria's talk, in which he concerned himself with a review of the paper and paperboard industries in India today, follows.

On the 26th January, India has attained her cherished goal of sovereign independent republic, after years of strife and struggle. On this occasion you will undoubtedly like me to assure our leaders of our willing cooperation in building the economy of the new Republic on a sound and stable footing. In order to achieve this economic stability we must increase production. Government has already fixed targets of production for the year 1950; for the paper and board industry, the target has been fixed at 110,000 tons.

Even before this, the industry had been making every endeavor to increase production. In the year 1948, production increased to 97,905 tons from 93,000 tons produced in 1947. In 1949, production during the first three quarters was 78,408 tons and the probable production for the last quarter is estimated at 27,000 tons.

The industry has been able to maintain this increase in production in spite of various difficulties experienced by it. At present, the major difficulty is the shortage in the supply of raw materials. The supply of bamboo, grass, etc., is insufficient and the cost of such raw materials has gone up. The partition of the country has affected the supply of raw materials because some of the valuable forests, which used to be the major bamboo source to some mills, have fallen within Pakistan jurisdiction. It is essential that wood pulp again be allowed under the Open General License until alternative sources of raw materials can be adequately developed and exploited. There is no ground at present for the apprehension that wood pulp imported from abroad would be a detriment to the bamboo pulp industry. Bamboo and grass are in short supply and their prices are very high. When the supply position of pulp is improved by imports, prices of indigenous raw materials would find a more reasonable level, thereby giving necessary relief to the industry.

Another point is the dependence of the industry on imported chemicals. Since the end of World War II prices of imported chemicals have recorded a further increase. The indigenous production of these items is not adequate and what is available can be obtained only at prices higher than those of imported articles. To bring down the manufacturing cost of paper, it is desirable that essential chemicals required for the paper industry should be allowed to be imported without any restrictions.

Prices, movement, distribution, and consumption of indigenous paper have been under control since 1942. Imported paper, on the other hand, is free from all controls but for selling price, and consumers are purchasing mostly imported paper. Under the existing circumstances, I feel that the Government should immediately remove control on consumption and distribution of indigenous paper. If thought necessary, the government might retain price control to ensure a stable price level.

At the last detailed Tariff Board Enquiry (1938) manufacturers of kraft paper were not in a position to produce their cost of production with the result that protection was not granted to this kind of paper. Many other varieties of paper and boards have never enjoyed protection and have been exposed to the full blast of foreign competition in their initial stages of production. Had the war not stopped importations of these varieties, it is very doubtful if the indigenous manufacturers would have been able to face competition and survive. I feel that the Fiscal Commission should recommend that all entrepreneurs who have courageously started new ventures should be given encouragement and assistance by the Government by safeguarding them against unrestricted foreign competition through grant of some form of interim protection, by restriction of imports or some other suitable measures designed to achieve that purpose.

Australian News

Australian Newsprint and Paper. Australian group of newspapers which formed a newsprint buying unit have reservations of 48,000 tons for 1951, which will be allocated in the same proportion as for 1950. Every newspaper which was a member of the group when reservations were made will receive its quota and the group will then cease to function. This newsprint will come from United Kingdom, French, Swedish and Finnish sources.

United Kingdom mills have been informed of the method of all allocation and have been requested to make their contracts conform to that principle. It is understood that the Reed, Dixon and Clyde mills are willing to make three year contracts, but finality has not yet been reached with Bowater.

With reservations of 48,000 tons plus an additional 50,000 tons from Tasmanian mills plus contracts made by other newspapers which are not members of the unit, it appears that Australia has a fair assurance of newsprint to 1951.

Australian requirements in the magazine paper field are estimated at 20,000 tons for 1950 and some anxiety nas been felt regarding an adequate supply from United Kingdom mills, especially in view of the pressing demands by British periodicals. Representatives from the Australian Trade and Customs Department have been invaluable in supporting the inofficial requests from Australian consumers.

Newsprint from New Zealand. Australian newspapers who were looking to New Zealand as a potential source of newsprint were prepared to help financially in the development of the Dominion's pine forests, Sir Lloyd Dumas, chairman of the Associated Press, said recently at the conference of the New Zealand Newspaper Proprietors' Association held at Rotorus. Mr. Dumas also had conferences on the matter with the new prime Minister, Mr. Holland, and spoke with David Henry, chairman of New Zealand Forest Products, Ltd.

Sheet Density Vs. Freeness*

Published here is a letter written by James d'A Clark, Research and Development Engineer, Longview, Wash., to the secretary of the Australian Pulp and Paper Industry Technical Association, South Melbourne, Australia. The letter is published with Mr. Clark's full permission.—EDITOR

"So much excellent work has been done in Australia on beating and refining problems that it seems a pity that the suggestion to compare results on a basis of sheet density rather than freeness is not more widely accepted.

"May I suggest that those who believe that freeness is a valid measure of 'degree of beating' or 'hydration,' carry out the following simple experiment which only takes a few minutes in a paper mill:

"Take some raw pulp and some mill-prepared stock from the machine chest and obtain their freenesses in the usual way. For example, with Southern Pine Kraft I obtained freenesses of 760 and 550 cc. on a Schopper Riegler with a 5 gm. sample from a machine making liner board. Then, make another freeness test with the raw pulp, but instead of using fresh water for diluting the sample to 1000 cc., use white water caught from beneath the fourdrinier wire. In my case, I got a result of 345 cc. In other words, the simple addition of white water immediately imparted to the raw pulp a high degree of beating, in fact a splendid kind of hydration—the kind without cut fibers.

"Unfortunately, burst tests made on sheets prepared from the raw pulp, with and without white water, showed no significant difference.

"To indicate how important is the choice of a basis of comparison of stock, compare the conclusions of A. J. Laugher from the Table II on page 171 of Vol. II, part of

Comparison of the Actions of the Sutherland Refiner, Valley Beater, the Clark Kollergang on Southern Pine Kraft

	Sutherland Refiner	Valley Beater	Clark Kollergang
Density—g/cc	0.65	0.65	0.65
Freeness—deg. S.R. 5 g.	630	660	675
Burst factor—metric	55	67	53
Tear factor—metric	130	150	145
Tensile brkg. length—m.	8120	8730	7800
Zero-span brkg. length—m.	15400	15500	15300
Percentage stretch	3.1	3.3	3.2
Specific surface — cm^2/g	15500	13000	14000
Per cent retained on 14 mesh	48	53	42
Per cent through 14—on 28	21	22	31
Per cent through 28—on 48	13	13	16
Per cent through 48—on 100	4	4	6
Per cent through 100—debris	14	8	5
Wtd. Av. fiber length—mm.	2.71	2.93	2.80
Approx. power or time	150 kw-hr/ton	20 mins.	15 rpg

which was reproduced on page 732 of *The Paper Industry and Paper World* of Sept., 1949, with those deducible from figures in the accompanying Table out of recent data from Southern Pine Kraft obtained in accordance with TAPPI standard methods. The 3 stocks are compared at a density of 0.65 g/cc., which is equivalent to a fairly good degree of beating for this pulp for board.

"My objection to the use of a miniature beater for treating pulp for testing is simply that it is utterly impossible to standardize a sharp cutting edge. The edges can't be rounded because even with the normal sharp edges, unless the consistency of the pulp is lowered to about 0.7 per cent and the normal roll pressure doubled (which procedure would quickly change the cutting edges), a miniature beater can't stimulate the cutting action of the massive mill machines. The reduction of freeness which is secured is the result of gently fibrillating every fiber, and separating some of the particles, whereas in practice the main cause of the freeness test going down with beating is the production of very fine debris derived from the smashing apart of only those fibers hit by the massive bars of the mill equipment.

"The laboratory kollergang simulates the heterogeneous cutting action of the heavy mill equipment; however, the smashing action is absent to produce enough debris to affect the freeness very markedly, but it nevertheless does produce a stock which is fairly close to mill beaten pulp as far as tangible sheet characteristics are concerned. Obviously, if one wanted to simulate the action of laboratory beaters or refiners, which, it should not be forgotten, are highly arbitrary and unique pieces of equipment, all one would need to do to a laboratory kollergang would be to greatly reduce the weight of the rolls. This would make a cheaper and nicer instrument in many ways and would, because of the higher strength and lower freeness developed with pulps, make the majority of investigators feel much happier with it. However, it would no longer than be an honest offering even though it would, as it admittedly does now, outperform every other piece of laboratory equipment for reproducibility."

P.S.—May I add that I have no financial interest whatever in the sale of any piece of pulp or paper testing equipment.

(*) This item was first published in the February, 1950, issue (p. 1345) of this magazine. Because of a typographical error and an omission, it is reproduced here in *in toto*.

Foreign Abstracts . . . . . .

Symposium on Paper and Paper Mill Waste Liquors

This was an informal symposium held at one of the sessions of the Technical Association of the French Paper Industry (l'A.T.I.P.) on November 24, 1949, and is given in stenographic detail. The seriousness of stream pollution in France is manifested by the passage of stringent laws in February, 1949, which punish those responsible for stream pollution by fines of 5,000-200,000 francs and prison sentences of 1-5 years. Delcroix and others discuss the situation of various French mills located on streams.

As an example in the Isère region, a board mill empties its waste liquors (highly colored) into a river, the water from which is used for washing purposes by silk manufacturers. The latter have filed claims against the paper mills. Technical studies of the pollution problems are underway. The two governmental agencies most interested are those dealing with "bridges and highways" and with "rivers and forests." The work initiated in this field by the "Straw division" (of l'A.T.I.P.), and the difficulties experienced by them are dicussed.

Methods for preventing stream pollution are alluded to, but very briefly. The technical committee of l'A.T.I.P. has authorized the expenditure of two million francs for a technical study in this field. Pierre Delcroix *et al. Bull. Assoc. tech. de l' Industrie Papetiere* 3, No. 5, 73-84 (1949) (In French).

Splitters

The author investigated the resistance of 21 spruce logs (*Picea ajanensis*) to splitting. The bolts had various diameters, and were approximately 60-116 cm. in length. These were split by a knife attached to a hydraulic ram and the cylinder pressure was recorded for each stage in the stroke of the ram. The experimental data permitted calculations for power requirements, size of the fly-wheel and crankshaft diameter. The article includes 2 tables, 6 graphs and 3 diagrams. Sogo Enokihara, *J. Japanese Tech. Assoc. Pulp Paper Ind.* 1, No. 2, 6-11 (1947). (Original in Japanese, with English summary). Through *B.I.P.C.* 20, 328 (1950).

Organic Mercury Compounds in Treatment of Wet Groundwood

Postwar experiments for preserving wet mechanical pulp by treatment with organic mercury compounds are reviewed. Difficult export conditions in the early part of 1949 forced many mills to apply disinfectants to groundwood pulps stored in Sweden and England, and the experience thus gained is discussed. Each of the mills used a white-water system that was not entirely closed.

In all of the *untreated* bales of pulp from these mills, red hot and bluing fungi developed, and serious discolorations were noted, especially in the groundwood bales stored in England. On the other hand, even with the lowest concentrations of two commercial disinfectants containing phenylmercuric compounds (150 g. per ton of wet pulp) red and blue color producing the fungal development was successfully inhibited. However, the highest concentrations used (250-300 g. per ton of pulp) did not produce sterility; certain fungi survived the treatment.

By removing the less tolerant species, the more resistant organisms thrived and developed large colonies which had a violet color and gave the pulp a spotty appearance. Whiteness measurement on sheets made entirely from discolored pulp showed a brightness decrease of 2-3% (when compared with a non-infected pulp sheet).

The fungus growing on groundwood was *Penicillium roqueforti* Thom (A) and the inhibiting concentration of phenylmercuric acetate for A was approximately four times that required for *Aspergillus niger* (B). Lower concentrations actually had a stimulating effect on the growth of A. Certain other species of *Penicillium* cause a red coloration with wet sulphite pulp. A is less tolerant to sodium pentachlorophenate (C), the inhibiting concentrations being 40-60% lower than those needed for (B). The odor of C, however, is objectionable and leads to complaints when paper is made from such treated pulps. Heat resistance of A was studied; complete sterilization of the pulp could be attained after 1 hour at 75 C. Mechanical pulps subjected to temperatures above 45-50 C. however, are subject to attack by red rot, hence the pulp must also be treated with organic mercurials. Toxicity of mercurials to A increased at higher temperatures, and sterilization was effected with 2 mg. per liter at 50 C. in about ½ hour.

The usual procedure is to apply the chemicals just before the Kamyr dryer. There is no obvious loss of disinfectant through dewatering or pressing. Mercury tolerant *Penicillium species* and possibly others (like *Phoma lignicola*, a bluing fungus which is tolerant to mercury) survive the treatment and may cause later pulp discoloration. The possibility of "shock treatments" of the system at intervals requires further study. The authors suggest experiments with organic mercurials at temperatures of 50 degrees or above.

Untreated pulps in England showed frequent discoloration by bluing fungi, red

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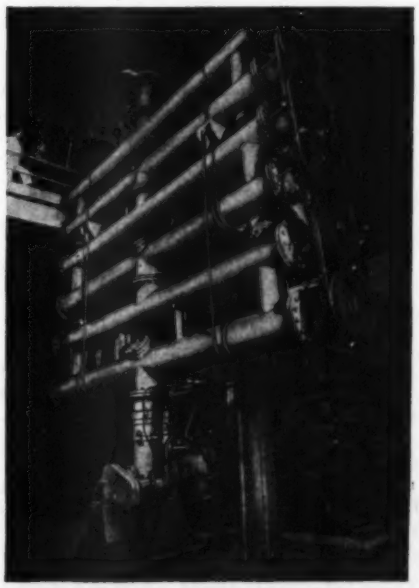

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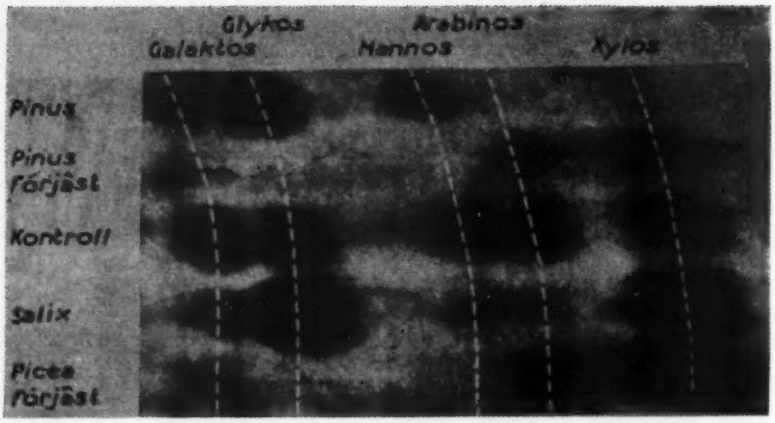
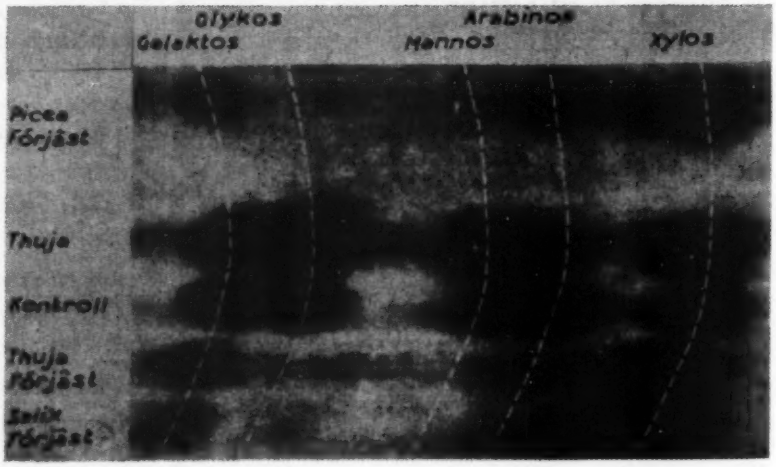
rots, even in comparatively fresh bales. Degree of attack by these microorganisms could be indicative of the temperatures at which the pulps were made. Mercurials gave definitely positive results. Stig O. Pehrson and Nils J. Lindberg. *Svensk Papperstidn.* 52, No. 22, 560-2 (1949). (In Swedish—through *Bull. Inst. Paper Chem.* 20, No. 6, 399-40, 1950.)

Paper Partition Chromatography as Applied to Wood Hydrolyzates

The carbohydrate composition of the hydrolyzates of six different woods (several of them important European pulpwoods) was examined by means of paper partition chromatography. The woods studied were spruce *(Picea excelsa)*, pine *(Pinus cembra)*, Arborvitae *(Thuja occidentalis)*, dwarf juniper *(Juniperus communis)*, willow *(Salix sp.)*, and silver birch *(Betula verrucosa)*. The method used was essentially that of Partridge *(Biochem. J.* 42, 238, 1948) and Wise, Green and Rittenhouse (TAPPI 32, 335, 1949) excepting that the acid was removed from the solutions by anion exchangers instead of neutralization with barium carbonate. The results indicate in all species the presence of appreciable amounts of glucose and xylose as well as mannose and galactose (although in one sample of pine hydrolyzate, no mannose or galactose was found). Arabinose was present in most species, but in subordinate amounts. It was however, absent from the birchwood hydrolyzates. The authors also chromatographed solutions from which the glucose and mannose sugars had been removed by complete fermentation. This permitted the chromatograms to pick up the unfermented galactose, xylose and arabinose clearly. The two figures show two typical chromatograms (six of which are given in the original article). Forjäst-fermented; glalaktos = galactose; glykos = glucose; mannos = mannose; arabinos = arabinose; and xylos-xylose. Kontroll = the control which contained a mixture of the pure sugars. Jacobus Sundman, Jouko Saarnio, and Charley Gustafsson *Finnish Paper and Timber J.* 31, No. 24, 467-71 (1949). (In Swedish.)





Molded Pulp Articles

In two articles, the author describes molded pulp articles (such as hollow bodies, building board, beer coasters, *et al*) which he states are a little publicized branch of the paper industry. Thus he describes various kinds of semiautomatic and automatic machinery used in their production. (The second article deals exclusively with hollow products). Friedrich Heim. *Allgemeiner Papier-Rundschau* No. 11, 545 (1949); *Wochbl. Papier fabr.* 77, No. 12, 335 (1949) (In German).

Materials Handling in Wallboard Manufacture

Problems connected with the transport of raw materials, their handling during manufacture and storage, and the shipment of finished products to the consumer are discussed. These apply to Swedish wallboard mills. Sweden exports about 30% of its annual wallboard production (235,000 metric tons) hence handling and shipment are of the highest importance. Because wallboard is more susceptible to injury than are wooden boards, methods used in transporting the latter cannot be applied to wallboard.

"Palletizing" offers possibilities and the present status of the standardization program for Swedish freight pallets is discussed. Norway and Finland have already adopted the same standard pallet size (48 x 32 inches, with double bottom); Denmark is still awaiting the results of certain studies. Standard pallets however can only be used for smaller sizes. Special pallets must be developed for larger boards. Simon Carlsson *Svensk Papperstidn.* 52, No. 21, 526-8 (1949). (Original in Swedish.) (Through *Bull. Inst. Paper Chem.* 20, 407, 1950.)

Corrosion Problems in Swedish Sulphate Pulp Mills

These problems are increasing, and as a result a special committee was appointed to insure their study. The present article summarizes their findings. As a result of their investigations, experiments were made with different types of steel for digesters, evaporators and electrofilters. The presence of silicon in steel decreases its resistance to white, green, and black liquors. On the other hand, 1-2% of nickel or cobalt causes a noticeable improvement in resistance to corrosion.

It was feared that the joint application of ordinary and stainless steels might cause galvanic corrosion, but the work of the committee actually indicated that this application offered protection to steel and decreased the corrosiveness of sulphate liquors, provided the latter contained small amounts of silicic acid or other anodic inhibitors. The corrosive effects of black liquor were reduced by oxidation according to the method of Bergström and Trobeck. Black liquors from different mills show great variations in corrosiveness even if their solid contents are similar. The committee is continuing to function. Carl-Gustaf von Essen. *Svensk Papperstidn.* 52, 549-59 (1949). (Original in Swedish, with English summary.)

Polyvinyl Chloride in Packaging

A review is given of the different applications of polyvinyl chloride in the packaging industry. These include: lacquering of paper, board, jute, etc., laminations to paper, board and metal foils, impregnation of fabrics for bag manufacture; molding of containers (from fibrous suspensions admixed with dispersions or emulsions of the polymer); the manufacture of plastic films and small containers made from them, and various closures and closure liners for bottles.

The advantage of such polymers or mixtures containing them are: non-toxicity, high chemical resistance, freedom from taste and odor, permanence, and low water-vapor permeability. The 55 references given are largely to the patent literature. Franz Kainer. *Kunstoffe* 39, No. 7, 165-8 (1949). (In German.)

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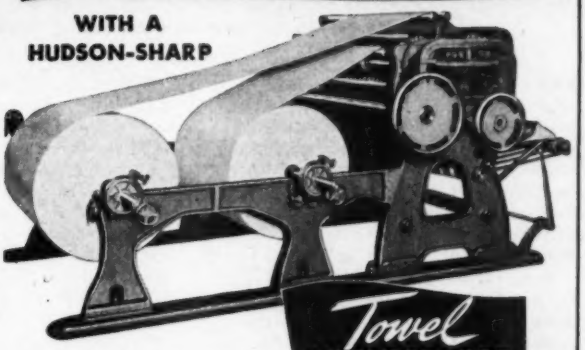

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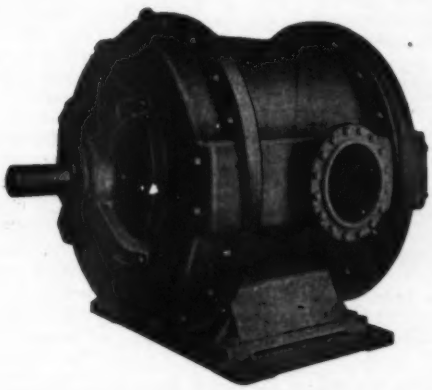

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Straw Pulp In Fine Paper Manufacture*

S. I. ARONOVSKY

Northern Regional Research Laboratory (USDA)

▶▶▶ The trend of the paper industry is away from general-purpose papers, and toward specialty papers designed to meet definite specifications. Straw pulp is eminently suitable for blending with other paper-making pulps to produce certain such "tailor-made" papers, the straw pulp providing those characteristics not so easily or so well attained with the other pulps.

Straw pulp has been used for the manufacture of paper and board since about 1800. Straw paper was widely used for wrapping meats in the United States until the early part of this century, and is still used for this purpose in some parts of Europe. Newsprint and many types of fine paper at that time also contained straw pulp blended with rag and other paper-making pulps. Even after the introduction of wood pulp, straw continued as a part of the furnish for many fine as well as coarse papers produced in this country.

Present Uses

The main commercial use for straw in the paper and board industry in the United States today is in the manufacture of corrugating strawboard. Wood pulp has displaced straw pulp in practically all other types of paper and board, and is also being used for corrugating. The higher density of wood, the relatively low cost of groundwood (mechanical) pulp, the long fibers of coniferous wood pulp and the relative ease of wood collection have been among the more important factors favoring the use of wood over straw.

Straw pulp and paper are manufactured and used in Europe and South America, particularly in those countries which lack pulpwoods. A number of mills in Holland, France, Germany, and Italy produce excellent bleached papers and board with wheat and rye straw pulps as major constituents of these products. The formation (sheet structure) in these papers and boards is extremely uniform, owing to the character of the relatively short but very thin straw fibers with a high ratio of fiber length to diameter. The English turned to straw during the war, and produced good grades of many types of paper from straw pulps prepared in their esparto and wood-pulp mills. At present Great Britain is in the process of establishing a permanent straw pulp industry.

Argentina has one of the largest strawpulp and paper mills in the world, with a daily production of about 100 tons of bleached pulp from wheat straw. Paper and board products from wheat and rice straws are also produced in Brazil and in other South and Central American countries. Beautiful, bright, strong bleached papers are made from rice straw in Java. Many other countries use straw pulps for the production of fine specialty papers and boards.

Most of the commercial straw pulps produced today are manufactured by the soda, kraft, or chlorine processes with yields of bleached pulps varying from about 35 to a reported maximum or 45 per cent, based on original straw. These pulps all have a common disadvantage in practical paper making; they are "slow," that is, water does not drain rapidly enough from the fiber web on the paper machine, thus reducing the rate of paper production. Although the slowness of these pulps is due partly to overcooking, it is due mainly to the presence of incompletely disintegrated fine platelets and cells which originate from the nodes and rachises of the straw. These platelets tend to pack on the wire mesh cloth of the paper machine, and thus prevent efficient drainage of water from the paper web.

Better Processes

By an improved neutral sulphite process, developed at the Northern Regional Research Laboratory and announced in February, 1948, is it now possible to obtain 50 to 52 per cent of bleached pulp from wheat straw. The neutral sulphite pulp produced by this process is freer, that is, faster draining, than the usual straw pulps, and it is as strong in all characteristics, except tear resistance, as the well-known sulphite pulps from softwoods. By this process the nodes and rachises are completely disintegrated and largely eliminated from the pulp. The pulp is easily bleached. It can be produced in the usual pulp mill equipment and does not require development of totally new methods and techniques.

A commercial trial of this process was made in a large Canadian newsprint mill early in 1948. The bleached neutral sulphite straw pulp was prepared under extremely adverse conditions, owing to the necessity of not interfering with the heavy production schedule of the mill. Nevertheless, the pulp produced under these circumstances was quite similar in yield and properties to those of the experimental pulps made in the laboratory. From a blend of this pulp, to the extent of about 20 per cent, with the regular wood-pulp furnish, excellent newsprint paper was produced on a high-speed paper machine with no interruption of the regular operating schedule and with no operating changes or difficulties.

The approximately 40 tons of straw-containing paper was printed in the high-speed presses of a large American newspaper plant, again without any difficulties or operating changes. This paper printed somewhat better than regular newsprint because of its better formation and smoother surfaces.

This neutral sulphite process is now being used in some strawpulp mills in Holland and Italy. It is also being considered seriously for new pulp mills in England, France, Argentina and Mexico.

The "mechano-chemical" process for pulping straw and other agricultural residues was announced by the Northern Laboratory in February of this year. As the name implies, this process involves simultaneous chemical and mechanical action on the raw material. The novel features of the process are that it may be carried out at atmospheric pressure in open vessels, and that astonishingly short cooking periods are required to produce suitable pulps.

A kraft straw pulp suitable for fine paper was produced in ½ hour's cooking time and a strawboard type of pulp in 1 hour, with the same amounts of chemicals, in both cases, as required for cooking under pressure. The straw pulps produced under these conditions were fully as good as those obtained by pressure cooking for considerably longer periods. The yields of bleached mechano-chemical kraft straw pulp, 50 to 52 per cent, were larger by about 8 per cent than those of similar kraft pulps produced by the older pressure pulping methods. Commercial trials of the mechano-chemical process on straw gave results practically equal to those obtained with the small laboratory equipment. Here again no special equipment other than that usually found in pulp and paper mills is required.

These two processes with high pulp yields and apparently lower production costs bring the manufacture of straw pulp into the competitive economic range of wood pulps. The questions that now occur are: How should straw pulp be used? Where in the paper and board picture does it fit best? Is it to be a temporary or stop-gap material to be used only in times of shortage of other materials, or will it attain a permanent position in the economy of the pulp, paper, and board industries?

Straw Not Substitute

The Northern Laboratory has consistently opposed the consideration of straw pulp as a substitute material for the paper industry. Rather, it has advocated the use of straw fiber as supplementary to wood and other paper-making fibers for producing specialty papers with the desired final properties. It is believed that every plant fiber, or at least every class of plant fiber, has some characteristic property or properties peculiar to itself.

By capitalizing on the particular properties of the various fibers, it should be possible to establish their rightful place in the industry on a utilitarian and economic basis. This approach to the utilization of agricultural residue fibers has received, through personal contact and correspondence, the full approval of a large number of the leaders in the pulp and paper industry, both in this country and abroad. Well-known commercial enterprises based on the specific properties of the raw materials involved are the production of superior insulating board from the sugar-cane bagasse, of corrugating paper from wheat straw, of cigarette paper from seed flax straw, and of thin book and Bible paper from esparto.

On this premise, straw pulp should be used in a blend with other pulps in such proportions that the final paper product will reflect in the desired degree the properties or characteristics contributed by the straw fiber. In other words, straw pulps should be used to provide properties not so easily or so well attained with other pulps.

The easy-bleachability, high hemicellulose content, and relatively high strength properties of this pulp suggest a number of types of paper to which it would contribute desirable characteristics. The relatively short but very narrow straw fibers, when used in sufficient quantity with regard to the other

(*) Abridged from an article in the July, 1949 *Chemurgic Digest* of the National Farm Chemurgic Council, Inc., New York 1, N.Y.

fibers present, should result in considerably improved formation in writing, tablet, ledger, mimeo, and similar non-coated papers. It should also improve the printing characteristics of such papers since the hydrated straw fibers in the paper would tend to reduce surface fuzz.

For the same reason, straw pulp should improve the surface of coating papers, such as magazine or book, and thereby result in more uniform coating of the paper. Well-hydrated straw pulp tends to form "tinny" paper; the inclusion of such pulp should improve the stiffness of normally limp papers, such as filled magazine and book, as well as that of art and drawing papers. These contributions of straw pulp are not merely conjectures; they have been borne out in actual pulp and paper mill operations, particularly in Italy and Argentina. In this country excellent book paper was made in an Ohio mill a number of years ago from a furnish containing about 15 per cent bleached straw pulp.

Straw Papers

A question that has cropped up recently with considerable frequency is, can good paper be made from straw pulp alone? The answer is yes, except for those papers such as wrapping and bag which require high tear resistance, a property derived mainly from long-fibered pulps. All-straw papers are made and used in some European countries and in the Orient. In the United States, however, where most fine papers are highly defined specialties with properties regulated by use requirements, all-straw papers, or papers made from any other single type of fiber would probably find only limited use. For instance, in the manufacture of book and magazine paper short-fibered soda or groundwood pulps are blended with softwood sulphite or krapt pulps. The long-fibered pulps provide the necessary strength while the soda or groundwood pulps contribute the required ink absorbency and smooth surface for good printing and the opacity to reduce or prevent "show-through."

Paper made entirely from bleached straw pulp can be printed and called book or magazine paper, but it will not meet all the use requirements of such specialty papers. Similarly, an all-straw sheet can be called newsprint and printed as newspaper, but it will not have the appearance, printing qualities, or opacity of present-day newsprint which is composed of a sulphite-groundwood blend. Furthermore, straw pulp or other chemical pulp cannot compete with groundwood pulp in cost, except under extremely abnormal conditions. Groundwood pulp, produced in yields of 90 per cent or greater by a relatively simple mechanical treatment of wood, will almost always cost less than chemical straw pulp, with its lower yield and its larger conversion costs.

The trend of the American paper industry in the last 30 years has been more and more toward specialty papers and toward narrower specifications based upon use requirements. As a result, the manufacture of all-purpose papers is decreasing. Two or more different types of fibers are blended to form a paper of definite specifications, with each type chosen to give the desired properties to the final product. The art of blending papermaking fibers is advancing rapidly. Paper makers are learning that each type of fiber

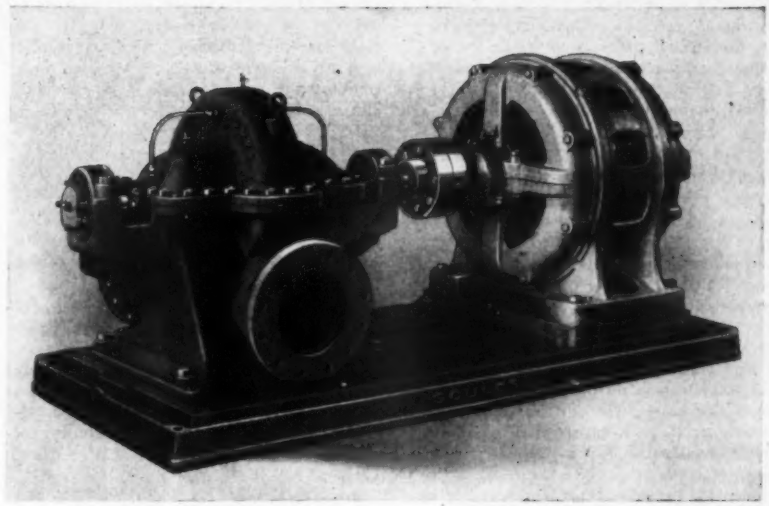

Fig. 3450

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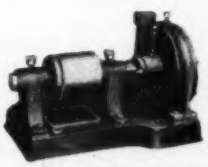

Fig. 3010—Cap. 5 to 100 G.P.M. Heads to 70 ft. Sizes 1″, 1½″, 2″.

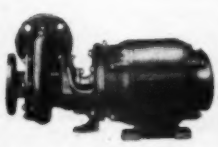

Fig. 3650—Cap. to 2000 G.P.M. Heads to 400 ft. Sizes1″ to 6″.

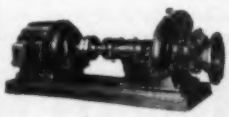

Fig. 3105—Cap. 250 to 4500 G.P.M. Heads to 220 ft. Sizes 4″ to 8″.

Fig. 3648—Cap. to 35 G.P.M. Pressures to 190 lbs. Sizes ¼ H.P. to 5 H.P.

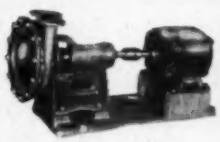

Fig. 3705—Stainless Steel —Cap. to 600 G.P.M. Heads to 200 ft. Sizes 1″ to 3″.

Fig. 3330—Cap. 40 to 2000 G.P.M. Heads to 3200 ft. Sizes 2″ to 8″.

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must be processed individually before blending, if the final paper is to reflect the optimum characteristics of the different fibers. They find it continually more difficult to process the different fibers together in a single operation and still obtain a paper that will meet the more-or-less rigid specifications required.

Straw pulp with its rapid hydrating and good strength properties, and with its ability to improve the formation, surface, feel, and other characteristics of most papers should fit right in with this trend. Abundant supplies of straw are available annually. The good progress made in recent years in the procurement, preservation, and handling of this material shows that the collection problems are well on the way toward solution. The high yields of straw pulp made possible by the new processes bring it into competitive position for paper making. These facts, together with the ever-increasing demand for pulp, paper, and board products make the future of straw as a permanent supplementary raw material for fine specialty paper products look very promising.

Chlorine Dioxide Bleaching of Sulphate Pulps*

KEITH S. MACLEOD

Associated Chemical Co. of Canada, Ltd.

Chlorine dioxide, generated in any of a number of ways from sodium chlorite, has some unique characteristics which have made it extremely useful. In Canada and the United States, there are now nearly 150 municipalities treating their water supplies with chlorine dioxide. Not only is it the newest and most efficient of a number of taste and odor control agents, but it is also an efficient bactericide, at least the equal of chlorine. The most recent large scale commercial application of chlorine dioxide is in the bleaching of flour where it is replacing nitrogen trichloride. This process is now in use by all the major milling companies.

In the bleaching of paper pulps, sodium chlorite and chlorine dioxide have both been widely investigated and are now in regular use producing superior qualities in rag, flax, sulphite and sulphate pulps.

The use of a multistage process using chlorine, caustic and hypochlorite for bleaching sulphate pulp has now been long established, but it is a recognized fact that high brightness levels and high strength retention cannot both be obtained by the conventional bleaching processes. One or the other must be sacrificed. Experience in the past few years has shown that both strength and brightness can be obtained through the use of a chlorite or chlorine dioxide bleach. There are three general ways of doing this:—

(1) The acid activation of sodium chlorite wherein the chlorite is first added to the stock and then acidified with mineral acid to a *p*H of approximately 4. Under these conditions, chlorine dioxide is generated in situ according to the reaction. $5\ NaClO_2 + 2H_2SO_4 \rightarrow 4ClO_2 + 2\ Na_2SO_4 + NaCl + 2H_2O$

(2) The hypochlorite activation of sodium chlorite, which is an alkaline reaction. This is carried out at *p*H 8.5—9.5 and entails the addition of sodium chlorite, either in solid form or solution, to the stock, followed by the hypochlorite. In this case the main reaction is:
$3\ NaClO_2 + HOCl \rightarrow 2\ NaCl + NaClO_3 + 2\ ClO_2 + H_2O$

(3) The application to the pulp of a solution of chlorine dioxide generated outside the reaction tower. This generation is accomplished by reacting the chlorite in solution with gaseous chlorine according to the following reaction:—$2\ NaClO_2 + Cl_2 \rightarrow 2\ ClO_2 + 2\ NaCl$

It is this latter method which is best suited to the continuous bleaching process of the large mills, although certain specialized bleaching such as rag and flax pulps use either of the activation methods.

While chlorine dioxide alone may be used in one or more stages of the bleaching process, continued experimental work has shown that chlorine can be mixed with it in various proportions, thus effecting operating economies over the use of either activated chlorite or pure chlorine dioxide. The chlorine in the chlorine dioxide-chlorine mixture when kept within the proper range of proportions has none of the destructive affects usually associated with conventional chlorine or hypochlorite bleaching. In fact, the presence of chlorine, while not affecting the strength of the pulp, appears to enhance the bleaching action.

Chemically, the action of sodium chlorite or chlorine dioxide appears to be a selective oxidation of the lignin and other color bearing compounds with no attack upon the cellulose structure. Such behavior can be explained by the oxidation potential of sodium chlorite which is intermediate between hypochlorite and peroxide. The oxidation potential of sodium chlorite at *p*H 9 is 0.66 volts while hypochlorite at the same concentration of available chlorine, has an oxidation potential of 1.2 to 0.95 volts over the normal bleaching range of *p*H 7-10.

Evidence as to the absence of cellulose degradation products and the maintenance of a high alpha-cellulose content may be obtained from such physical and chemical tests as viscosity, alpha-cellulose content, copper number and alkali solubility. Mullen, tear and fold tests also show that the pulp has suffered no strength loss through chlorine dioxide bleaching.

(*) Abridged from paper given at the 1950 Annual Meeting of the Technical Section Canadian Pulp and Paper Association, held at Montreal, P. Q., January 25-27, 1950.

The use of chlorine dioxide or mixed gases (chlorine dioxide and chlorine) is not a fixed process and can never adhere to rigid rules of operation due to the wide variations in bleaching conditions between mills. Chlorine dioxide bleaching must be adapted to each mill to suit its particular conditions and requirements. From experience, certain general conditions have become evident and can serve as a guide in the use of chlorine dioxide and mixed gases.

The chlorine dioxide-chlorine mixture should generally be not less than 1.1, (i.e., one part available chlorine as chlorine dioxide to one part as chlorine) although lower ratios have been used depending on the final pulp strength desired. Excess chlorine in the system will tend to nullify the protective effect of chlorine dioxide. A good working ratio is one to two parts chlorine dioxide to one of chlorine on an available chlorine basis. This should not be considered as a limit as some pulps will require a good deal more chlorine dioxide than others, particularly if the pulp is rather weak initially.

pH

Operating at *p*H levels of 6, 8 and 9, there appears to be little difference in brightness levels and strength retention between these three conditions, but to avoid corrosion difficulties, a *p*H range of 8.5—9.5 would be preferred. Where highly corrosion resistant equipment is available, the bleaching can be carried out on the acid side and produce excellent results. The addition of chlorine dioxide or mixed gases to the stock will tend to drop the *p*H, and in mill operations it will usually be necessary to maintain a small, continuous addition of caustic to the stock as a buffering action.

Time

While a fifteen minute retention time will give a good bleach on semi-bleached pulp, up to an hour may be considered the minimum desirable retention period for some stocks, depending upon the previous treatment they have received.

Temperature

Most laboratory studies of chlorine dioxide bleaching have been carried out at 100 F., and in mill operations, temperatures will vary from 80 F. upwards. Temperature, being a rate governing factor, can be altered to suit mill conditions.

To date, most mill work with chlorine dioxide bleaching has involved its use in only one stage, as an alternative to the final stage hypochlorite bleach. This has been due chiefly to economic reasons, and obviously, if chlorine dioxide were used in one or more preceding stages, still higher levels of brightness could be obtained with high strength retention.

When using mixtures of chlorine dioxide and chlorine, the ratio of the two is expressed in terms of weight of available

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chlorine. The available chlorine content of sodium chlorite is 130 per cent as compared to 100 per cent for chlorine itself. On this basis, the exact weights of chlorine and chlorite required for any ratio of mixed gases can be calculated.

Let us assume that we wish to apply 0.5 per cent total available chlorine per ton of pulp at a 2:1 ratio of chlorine dioxide to chlorine. The feed rates for chlorine and chlorite solutions can be calculated as follows:

$2000 \times .005 = 10$ lb. available chlorine

$10 \times \frac{1}{3} = 3.33$ lb. available chlorine as Cl_2

$10 \times \frac{2}{3} = 6.66$ lb. available chlorine as ClO_2

To react with the sodium chlorite, it will require $6.66 \times 0.2 = 1.33$ lb. Cl_2

Total chlorine required $= 3.33$ lb. excess $+ 1.33$ lb. for activation $= 4.66$ lb. Cl_2/ton

Sodium chlorite required $= 6.66 \times 0.8/1.3 = 4.08$ lb./ton

Knowing the concentration of the chlorite solution and the ton/hour rate of the bleach plant, the feed rates of chlorite and chlorine are adjusted to give a continuous flow at a constant 2:1 ratio.

Of the mills now using chlorine dioxide bleaching, two kraft mills in particular represent different problems and different ways of handling this bleaching agent.

One mill was faced with a serious and immediate problem of increasing the G. E. brightness of its bleached kraft. The brightness levels required were not possible with its existing bleach plant and an additional stage was indicated. Since this pulp was of fairly low strength initially, more vigorous hypochlorite bleaching would have invited further degradation of the stock. A good deal of experimental work both on a laboratory and mill scale was carried out to determine the optimum conditions for operating with chlorine dioxide. A process was evolved by which this mill can now produce bleached kraft pulp of considerably higher G. E. brightness with an over-all strength retention of 90-95 per cent. To obtain these results in this particular mill, chlorine dioxide is used in place of the final hypochlorite bleach.

Similar results have been obtained recently in a kraft mill where experimental work on a mill scale is still in rather early stages. While the optimum quantities and operating conditions for this mill have not yet been definitely established, the preliminary results are certainly an indication of what can be expected. Applying 0.5-0.7 per cent available chlorine, at ratios of 2.5:1 and 2:1 chlorine dioxide to chlorine, in place of the regular 0.8 per cent hypochlorite bleach in the final stage, has produced a G.E. brightness in excess of 86 with a very significant increase in strength. With normal bleaching procedure, the bleached viscosity of this pulp averages about 100 centipoises (1 per cent cupriethylenediamine at 25 C).

The average of samples taken following bleaching with mixed gases was approximately 200 centipoises. Mullen and tear values of the bleached pulp showed no drop from the unbleached values.

Equipment

The equipment required in a mill for the generation of chlorine dioxide from chlorite is not elaborate or expensive. Sodium chlorite solution is prepared in a holding tank equipped with an agitator. Chlorine

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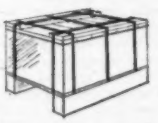

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gas is supplied from a regular evaporator. The chlorite solution is fed by means of a proportioning pump while the chlorine feed is conveniently controlled by a rotameter. The two chemicals meet in a tee near the point of application and react immediately to form chlorine dioxide. The resulting chlorine dioxide solution, or solution of mixed gases, is then applied directly to the stock. At the point of reaction, the sodium chlorite solution should have a concentration of approximately 0.25 lb./U.S. gal., thus the addition of dilution water to the system is usually required to arrive at this concentration. Once the proper feed rates have been established, the operation of this chlorine dioxide stage is as readily controlled as any of the other stages of the bleach system.

For some time now, varying quantities of Swedish kraft have been available to the American market. The quality of this pulp is considerably higher than any produced in this country, and can be attributed to a liberal use of chlorine dioxide. In this way, it has become possible to produce a pulp with a beautiful bluish-white tinge, 5-8 G.E. units whiter than for previous qualities, and with excellent papermaking properties. Thus, the strength is 13.25 per cent better and the degree of beating required for obtaining optimum properties is considerably shortened.

TAPPI Abstracts*

The Use of Radioisotopes for Process Control in Pulp and Paper Manufacturing, by A. P. Schreiber, Tracerlab, Inc., Boston, Mass. (General Session)

Radioisotopes, one of the most important groups of byproducts of atomic energy developments, are already proving of assistance to a large segment of industry and science. To accelerate their utilization a greater realization of their potentialities and necessary specialized techniques in using them is required. One of the most promising uses of immediate application to industry is in gaging and physical measurement problems. The principles of a beta ray absorption gage for continuous noncontacting measurement of basic weight are outlined. An even newer development, a gage utilizing the principle of beta radiation backscattering, can be used for continuously measuring extremely thin condenser and cigarette paper or for gaging coatings such as barium sulphate on photographic paper.

The use of radioisotopes as tracers for following constituents through a series of chemical reactions or to carry out flow studies are discussed, and examples of tracer techniques for pollution problems and material balance studies are outlined. The pulp and paper industry will also receive a great deal of indirect benefit as a result of research work done with the aid of radioactive tracers by metallurgists, petroleum research chemists, and others who contribute to the research and development of the components of which a paper mill is constructed.

Examples of contributions of radioisotopes toward furthering basic knowledge of metallurgy, the mechanism of friction, and lubrication are discussed. While it is not anticipated that radioisotopes will cause immediate widespread radical changes in industry, they have already proved to be of great value as a versatile tool in many projects which were heretofore either very difficult or actually impossible to carry out with conventional methods.

A Rapid Instrument for Fractionating Pulp, by A. E. Reed, Gaylord Container Corp., Bogalusa, La., and James d'A. Clark, Consulting Engineer, Longview, Wash. (Papermaking—Cylinder Machine Session)

The new four-screen classifier developed by Clark is described and its operating procedure given. This instrument divides a 5-gram sample of pulp into four fractions plus debris, in 4 minutes.

Reference is made to the method of calculating the weighted average fiber length by weight of a pulp sample from classifier data. This method was published earlier and is not repeated in detail. The operating conditions and the weighted average fiber length of the fibers in each fraction were determined experimentally using Clark's projection method. These fiber lengths were as follows: On 14, 3.85 mm.; 14/28, 2.70 mm.; 28/48, 1.70 mm.; 48/100, 0.95 mm.; through 100, assumed 0.10 mm.

The distribution of fiber lengths was plotted to verify the above method. It was found that in this classifier the weighted average fiber length by weight in each fraction was 8 per cent greater than the arithmetical average fiber length.

Mill data are presented to demonstrate the usefulness of this instrument and method in pulp refining studies.

Economic Considerations in White Water Treatment, by V. J. Calise, Graver Water Conditioning Co., New York, N.Y. (Water Session)

This paper deals with various types of equipment now available for reducing loss of stock in white waters from pulp and paper mills. In particular, two modern designs of reclaimers are described in detail, both embodying the principle of contacting the incoming white water with previously accumulated solid precipitates and stock in order to effect virtually complete removal stock from the white water.

(*) Abstracted from papers presented at the annual meeting of the Technical Association of the Pulp and Paper Industry, held in New York City, Feb. 20-23, 1950.

The advantages and possibilities of reusing clarified white water and recovered stock and the necessity for solving the problem of stream pollution are all discussed. The two modern white water reclaimer designs are described in terms of minimizing initial investment, minimizing long term operating cost and tailoring the equipment to fit specific plant operating conditions.

An actual example of a complete engineering calculation of such a reclaimer installation is shown with equipment costs, installation cost, operating costs and savings obtained.

Flow sheets of several other typical plants are shown and cost data given.

Some Factors Affecting Slime Formation and Freeness in Board Mill Stock, by Willem Rudolfs and Nelson L. Nemerow, Rutgers University, New Brunswick, N.J. (Water Session)

Recirculation of white water is a common practice in most paperboard mills, as a method of pollution abatement and of conservation of fiber, filler, and water. Slime is one of the major nuisances resulting from such recirculation. The slime causes a measurable decrease in the drainage rate of the machine stock.

A laboratory handsheet machine was designed and constructed to measure the drainage rate (freeness) of recirculated white water. Significant results can be obtained with this machine when sufficient slime is formed to cause a decrease of only 2 seconds in the drainage time.

It was found that slime forms to some extent when white water is recirculated without a pH control and within a temperature range of 20 to 37 C. The growth as measured by freeness will vary from 20 to 250 per cent, and also the optimum growth temperature will vary slightly from one mill to another. Slime formation is always preceded by a period of about 5 days during which the pH of the recirculated white water drops. Recirculated white water builds up in dissolved solids, and once these solids are seeded with the proper food and the micro-organisms are acclimatized, slime will form. However, a pH of 4.5 or a temperature of 50 C. was found to prevent slime growth. The pH can be controlled with alum or, better, with sulphuric acid. This slime growth is inhibited by replacing the nonsettleable portion of the whitewater with fresh water before recirculating. Replacing the settled fiber with fresh dried paperboard stock reduced slime growth by only 50 per cent. Slime formation is greatly stimulated by casein, slightly stimulated by starch, and not affected at all by rosin.

Control of Sewer Losses, by John G. Dobson, The Foxboro Co., Foxboro, Mass. (Water Session)

Loss of chemicals and fiber to the sewer can be substantially reduced by continuously surveying and controlling these losses. At the same time substantial reduction can be made in stream pollution. The first step in such a survey is accurate measurement of flow which can be done with Venturis orifice plates, or in most

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cases weirs or flumes. The next step is accurate sampling, integrated in terms of total flow. This can be done by sampling pumps actuated so as to operate for times proportionate to the actual flow. The samples should be analyzed for the important constituent, and the results of analysis made available to the men responsible for operating the particular portion of the plant. The pump should be selected taking into account the amount of semisolids present in the waste. Sampling points should be selected so that a truly representative sample is obtained. Instantaneous readings, and signals of changes of chemical compositions of the waste, can be obtained by the use of conductivity instruments. In this way an operator can be warned when a sudden increase in concentration of one of the waste materials occurs.

The Operation and the Application of the Waco Filter, by Joseph K. Perkins, Improved Paper Machinery Co., Nashua, N.H. (Water Session)

The Waco filter is a mechanical filter used for the removal of suspended solids from liquids. It has high efficiencies when used as a raw water filter, paper machine saveall, and as a mill sewer catchall saveall.

Other applications, which are successful, include filtration of black liquor in the kraft process giving filtrates of 3 ppm. going to the evaporators; filtration of syrups, and filtration of liquids containing granular materials.

In principle the Waco filter is the only mechanical filter which forms its own filter paper through which liquid is filtered continuously.

Modulus of Rupture Test For Paraffin Wax, by L. E. Hoag, American Can Co., Maywood, Ill. (Wax Testing)

A simple apparatus and procedure is described for determining the modulus of rupture of paraffin wax. This property has been found to be of considerable importance with respect to the serviceability of paraffined fiber milk containers. Data are presented relating the stiffening effect of paraffin on paper to the modulus of rupture of the wax used.

Small slabs of paraffin wax, prepared by casting on water, are broken by applying a load midway between two supports. The load is applied to a bar resting across the slab by flowing water into a plastic bucket suspended from the ends of the bar. The apparatus automatically diverts the water stream from the bucket at the moment of break and the modulus in pounds per square inch is calculated from the load and the dimensions of the slab at the point of break.

This test has been in use in four different American Can Company fiber milk container producing plants since 1945 and has been applied on a routine basis to all shipments of paraffin wax received for use on fiber milk containers. Data, showing the results of the test on four samples submitted to seven different laboratories using this test are presented as well as a series of ten determinations run on the same sample in one laboratory.

The results of breaking the slabs air side down are compared with those obtained when the specimen is broken water side down and the conclusion reached that the modulus of rupture should represent the average of the same number of specimens broken each way. Equipment for performing this test is commercially available from Thwing Albert Instrument Co., Philadelphia, Pa.

The Vortrap—As Applied to the Paperboard Industry, by H. E. Ingalls, Nichols Engineering and Research Corp., New York, N.Y. (Papermaking-Cylinder Machine Session)

The Nichols Engineering & Research Corp. has developed larger Vortraps with new features for special applications in the paperboard industry.

The 8 and 10-inch Vortraps have been developed particularly for the removal of large quantities of solids and foreign matter from all kinds of baled waste paper stocks. This paper describes this application with special emphasis on the layout as it may apply to an existing as well as new, stock preparation systems.

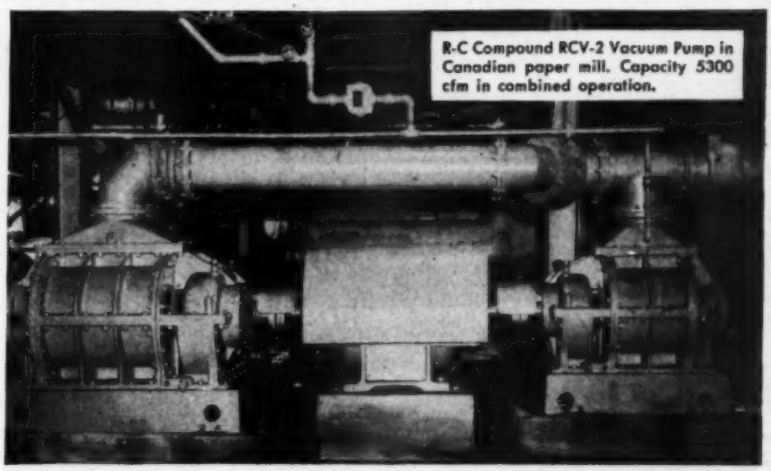
Two regular types of operation are discussed, namely, the standard and automatic methods. The standard operation follows long established procedures by which foreign matter is removed and collected in a waste receiver which is emptied manually. The automatic operation involves the use of a new, specially designed automatic rejects discharge valve which permits a continuous discharge of rejects, and is very important in handling high dirt content stocks. This valve is equipped with a multiport rotor with rubber vanes to prevent binding and is usually driven at a constant speed of 2 r.p.m. Water at uniform pressure is used to control the loss of fiber in the rejects and insure trouble-free operation. This Vortrap system is effective in the removal of sand, dirt, clips, pieces of steel, glass, foil, rubber bands, and similar material found in baled waste papers. The Vortrap allows a compact layout and replaces settlers and similar equipment.

Economies result from a cleaner stock throughout the system. Reports of increased machine speeds, increased production due to fewer breaks on the paper machine, higher tests, and better quality board are common with all large Vortrap users.

Further direct economies result from decreased maintenance on jordan and refiner fillings, screen plates, wires, calender rolls, and other equipment in the paper machine system.

Effect of Roll Load in Beating of Southern Kraft Pulp, by C. S. Walseth and C. G. Geijer, Union Bag & Paper Corp., Savannah, Ga. (Alkaline Pulping Session)

Four 2000-pound Jones-Bertrams beaters are included in the stock preparation system of No. 5 machine at the Savannah plant of Union Bag and Paper Corp. A brief description of this installation is given. In an effort to increase the refining capacity of these beaters, a study



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was made of the effect of increased roll load on capacity, quality, and power consumption. Variation in roll load is accomplished by means of pneumatic cylinders, and loads up to 200 per cent of roll weight were studied. Special beater runs were arranged during the course of regular production, and stock samples taken at intervals were evaluated by freeness measurements and physical tests on TAPPI standard handsheets. The pulp was unbleached kraft with a permanganate number of about 26.

The results indicate that increase of roll load up to 200 per cent for beating times up to 30 minutes will increase refining capacity, but for longer beating times the advantage of higher roll loads is lost.

Curves showing burst vs. power consumption at different roll loads indicate that the same degree of strength development is obtained with less power consumption as roll load is increased, except at high roll loads and long beating times.

In the high freeness range (above about 830) an increase in roll load from 125 to 200 per cent yielded higher bursting strength at equal freeness, but at lower freeness values this trend was reversed. The relationship between burst and tear showed that some loss in tear results from increasing the roll load from 125 to 200 per cent.

The Operation of the Cyclator in White Water Recovery, by F. A. Eidsness, Infilco, Inc., Chicago, Ill. (Water Session)

The Acme Paper Board Division of the Federal Paper Board Co., Reading, Pa., produces manila-lined tube and can board and various specialty papers. White water wastes resulting from the process were discharged into an adjacent creek and due to action taken by the Pennsylvania State Sanitary Water Board waste treatment had to be practiced prior to discharge. The consulting engineer's investigations indicated that the waste water could be effectively coagulated with an alum dosage in the range of 5 to 7 grains per gallon with the addition of 3 to 5 ppm. of activated silica.

Several months ago a Cyclator with necessary control and chemical feed equipment was installed for treatment of these wastes. Alum and activated silica are fed into the primary reaction zone of the unit and chemical reactions take place in the presence of previously precipitated particles. These particles are recirculated and discharged to the outer zone of the tank where larger particles settle to the bottom for thickening and removal, the lighter particles being recycled into the inner zone for increase into larger particle size. The clarified liquor flows over the peripheral weir to the stream.

After the plant had been in operation several weeks it was noticed that the precipitate would rise periodically in the outer portion of the unit and during periods of manufacture when titanium filler was used good coagulation was not obtained. Investigation indicated that the floating particles were caused by air entrainment of the coagulated fibers. Further investigations indicated that if the white water was reduced to a thin sheet, this air did separate and coagulated particles settled properly. Within the past month an aerator of the cascade type has been installed which has eliminated this difficulty. It was further found that proper coagulation of the wastes when titanium filler was used could be effected at higher alum dosages. Composite samples of influent, effluent, and underflow were analyzed during a 5-day period the latter part of November. Although concentrations of the underflow have been obtained over 50,000 ppm. the average consistency is in the order of 25,000 ppm. The average suspended solids of the influent are in the order of 200 to 300 ppm and effluent 22 ppm.

Control of Condensate Return Line Corrosion, by William A. Tanzola, W. H. and L. D. Betz, Philadelphia, Pa. (Water Session)

The perplexing problem of condensate return line corrosion is discussed from the standpoint of the basic factors that are involved and the mechanism of the corrosion reactions. The sources of the corrosive gases, oxygen and carbon dioxide, are outlined, and methods of removal of dissolved oxygen and reduction of carbon dioxide are presented both from the standpoint of mechanical changes that can be made to the condensate system and the external water treatment methods of the water that are possible.

Complete elimination of carbon dioxide from condensate systems is not possible, and even small concentrations of this gas in solution can produce undesirable amounts of corrosion. The use of neutralizing types of amines for control of carbon dioxide corrosion are cited. The introduction of a new approach to the control of condensate corrosion through the use of filming type amines is discussed. These materials produce an impervious film of approximately monomolecular thickness that render the metal surfaces nonwettable and act as a barrier between the metal and corrosive condensate. This new approach to the problem has developed a more economical solution to corrosion of condensate lines. By means of the various methods of treatment presented the economical solution to most condensate corrosion problems can be achieved.

The Beater Addition Process for Producing Laminating Papers, by Francis H. Snyder, L. Spiwak, and Alfred E. Moyer, Snyder Chemical Corp., Bethel, Conn. (Plastics Session)

The beater addition of resins for plastics laminates has long been of considerable interest but has not proven feasible until this past year when a new group of water-insoluble phenolic resins was introduced. The procedure for addition of these resins to pulp is simple and direct, and difficulties previously encountered in attempts to add resins in the beater are eliminated, Freeness is increased upon addition of resin, permitting greater machine speeds. Retention of resin and fines in open systems is high, and 94 to 98 per cent yields obtain at resin inputs from 1 to 60 per cent. Broke is readily recovered by simple defibering. Since the resin completely surrounds each fiber, stocks prepared in this manner differ from off-machine saturated types in that fibers are bonded together with resin in the former, and by hydrocellulose in the latter; this difference in physical structure results in significant changes in physical and molding properties. Improvements are noted in impact, tensile, and flexual strengths, cold-punchability, machinability, post-forming. Special electrical and light-stable decorative grades are available. Stocks may be pigmented and further modified by elastomer latices. Low-cost decorative laminate core-stocks are produced by adding relatively small amounts of resin to hardboard pulps. A redwood fiber-resin combination also indicates considerable promise for core-stocks. Papers containing 5 to 10 per cent resin can be off-machine impregnated at considerably greater speeds, with improved physical properties. A backing sheet has been developed which permits bonding of laminates to plywood, etc., without prior sanding. Asbestos-filled stocks may be prepared containing up to 60 per cent resin, and molded at 50 psi. Honeycomb-core papers are less brittle, and physical properties are not diminished by wetting; similar improvements are obtained with plywood masking overlays. Most of the developments described are in commercial production.

Application of the Duotrol to Jordans and Refiners, by T. Agronin, Shartle Bros. Machine Co., Middletown, Ohio. (Paper-making-Cylinder Machine Session)

The problem of providing remotely operated equipment for accurate adjustment of jordan and hydrafiner plugs has been given considerable attention by the Shartle-Dilts organization for the past ten years.

The question of pressure control vs. power control was the subject of an exhaustive study made in 1945 by the Dilts Laboratory. An analysis of numerous laboratory and field tests indicated that time-horsepower control gave more uniform results than the time-pressure control.

It was found that results obtained on the time-horsepower basis correlated and that results could be predicted for changes in such factors as time, power, consistency, and freeness. This condition, however, was not true for the time-pressure control as the results obtained did not follow a typical curve, but were erratic and unpredictable whenever conditions were changed. On this basis a program of development and field testing was started which resulted in the present design of the hydrafiner and jordan Duotrol.

The Duotrol consists of a mechanical plug adjusting mechanism which is operated by a gear head motor. This motor adjusts the plug in or out to hold a predetermined power setting on the hydrafiner or jordan driving motor. The impulses are transmitted from the driving motor to the adjusting motor by means of a contact-making ammeter or wattmeter. Any change in power requirements of either the hydrafiner or jordan is instantly compensated by the plug adjustment through this ammeter or wattmeter control.

The results of these installations have been very interesting. In the case of the hydrafiner, a constant application of power has indicated that there is a saving of approximately 20 per cent in power for the same amount of work done. In the case of the jordan, mills have installed it for its remote control set-up whereby the jordan can be operated from a control panel on the machine floor, and also for its ability to maintain uniform fiber development characteristics.

Casein Adhesives in Roll Coating, by J. Wilson Smith, R. T. Trelfa, and H. O. Ware, Hercules Powder Co., Wilmington, Del. (Coating Session)

High-quality coated paper, normally associated with casein adhesives, can be easily prepared on roll coating equipment. Satisfactory techniques for applying casein colors to paper on this type of equipment were first developed in the laboratory, and subsequent experience has proven that these procedures are adaptable to commercial machines.

The laboratory phase of this development was performed with an experimental machine-coating unit and the Hercules Hi-Shear Viscometer.

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Using this equipment, it was found that the flow properties of most colors governed their operability on the machine. Unmodified casein colors have high viscosity and pronounced dilatant tendencies, precluding production of acceptable coatings. These properties can be corrected by incorporating proper rheology-modifying agents, such as sodium sesquisilicate, into the color. With the sesquisilicate modification, some colors have satisfactory operating characteristics up to 65 per cent solids.

Two mixing procedures are recommended. In one, dry casein is added to a pigment slip and solubilized in the presence of the pigement. In the other, a casein solution is prepared first, and then the dry pigment is added to the solution. Either process can be used with sigma-blade mixers, but only the former is recommended with paddle-agitated mixing tanks.

Paper from casein colors modified with sesquicilicate can be hardened by treating with formaldehye solution or vapor.

Enzyme Conversion and Its Application to Paper Machine Coating, by D. A. Hughes and W. L. Craig, R. T. Vanderbilt Co., New York, N.Y. (Coating Session)

Starches of high adhesive strength and relatively low viscosity are used extensively in the paper industry. Gelatinous starches process good adhesive strength but must be treated in some manner to reduce their viscosity. Such treatment or liquefaction may be accomplished without loss of adhesive characteristics by enzyme conversion.

Enzymes are biocatalysts and their name indicates the specific reaction for which they are used. The enzyme alpha-amlase functions with amylose (starch) and attacks specific linkages reducing the starch granule into smaller physical units. This action, which greatly reduces the viscosity, is accomplished without the formation of any appreciable amounts of reducing sugars. Being organic, the catalytic action of the alpha amylase depends upon a great number of factors including temperature, pH, concentration, and the presence or absence of certain inorganic salts. To obtain maximum efficiency from the enzyme these conditions must be observed during all conversions. In most cases the optimum dictates that the conversion be carried out for 30 minutes at a temperature of 160 to 170 F. and at a pH of 6.5 to 7.5. The amount of enzyme depends upon the liquefon content thereof and upon the concentration of the starch paste to be converted. To secure uniformity each conversion is carried out in the same manner, preferably by an automatic cam controller. Inactivation is effected at the end of the conversion period by prolonged high temperatures (200 F. for 10 minutes) or by the addition of salts which destroy the enzyme's activity. Blending of this converted starch with pigments is accomplished by the same procedure as is used for any of the paper coating adhesives.

A new process has been developed in which the starch is converted in the presence of the mineral fraction. By virtue of this process, a lower adhesive to pigment ratio is possible which results in higher finish of the calendered sheet. Bonding strength is improved because of the superior initial inter-dispersion of the adhesive and pigment.

Enzyme converted starches are particularly adaptable to machine coatings because they afford maximum flexibility of the finished products' physical properties. These properties can be adjusted with relative ease in cases of subsequent machine or furnish variation. Instrumentation required for proper conversion is slight and its cost is soon balanced by the saving in raw material cost involved in an enzyme conversion process.

Formulation and Properties of Laminating Varnishes, by C. B. Bennett, Catalin Corp. of America, New York, N.Y. (Plastics Section)

The conventional laminating varnish is a solution of a thermosetting resin in water or water and a solvent, such as ethyl alcohol. Paper is the most common base material, and properties discussed apply to paper base laminates bonded with phenolic, urea, or melamine varnishes.

The properties necessary for any varnish to be useful in conventional laminating are stability of at least 1 month at 25 C., at a minimum solids of 50 per cent and at viscosity of less than 10 poise at 25 C., absence of excessive odor or toxicity, reasonable cure time, and relatively low cost.

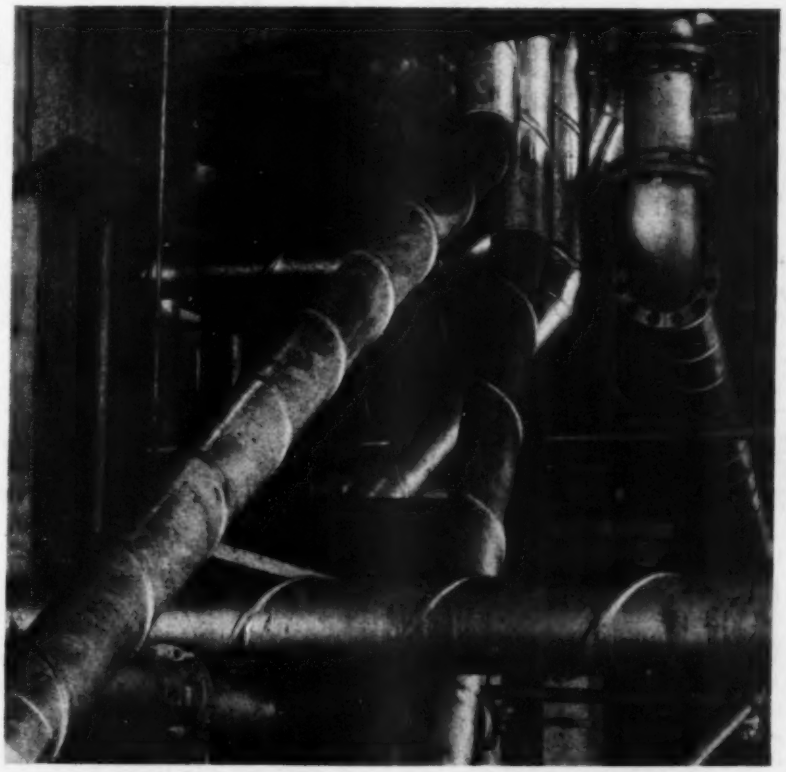
Other properties will vary with the type of laminate desired. Most laminates may be classified as mechanical, electrical, punching, or decorative.

Mechanical grades are mainly for structural application and a phenolic varnish is generally used on a kraft paper base. The following properties are indicated: (1) A low inherent viscosity for good penetration and corresponding excellent dimensional stability, (2) A strong alkaline catalyst so that a short cure time and good conversion to resin solids will result, (3) The proper mole ratio for good conversion and low cost, and (4) Modifications to yield a laminate without odor or dark color.

Electrical grade varnishes are also generally phenolic and laminates are made to pass rigid electrical tests. Important points in formulation and properties are: (1) Replacement of strong alkaline catalysts with ammonia or amines that are less conductive, (2) Possible use of cresols and xylenols instead of phenol, and (3) longer cure time for extended flow.

Punching grade varnishes are phenolics modified to yield laminates with better plasticity and elasticity. Usually a phenolic of the electrical type is reacted with drying oils or other special plasticizers are added. Plasticizers must have low polarity, low water solubility, low affinity for water, and compatability with the cured phenolic resin. Decorative varnishes may be phenolic, urea-melamine, or melamine. Phenolic varnishes serve well for dark colors but their light stability is not good enough for pastel colors, and melamine varnishes are widely used now for these light colors. Melamine varnishes are superior to ureas in water, heat, and abrasion resistance. These varnishes must be free of colored or color forming bodies.

The proper varnish and paper can be best transformed to the desired laminate only after a full technical discussion between the buyer and his paper and resin supplier.



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Because it is compressible, a new valve lubricant known as Hypermatic can be injected into a plug valve after which it will feed automatically into the internal channels and grooves of the valve. When pressure becomes too low after a period of use it can be repressurized by turning the lubricant screw or by adding more Hypermatic either in stick form or by a lubricant gun. Applicable to most pressurized plug valves, Hypermatic, when spread in a thin film on valve seating surfaces, resists displacement and prevents leakage. Nordstrom Valve Div., Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.

Pulpwood Handling Crane

Boom can be used on many material handling jobs.

Counter-weighted boom type crane requires only enough power to raise or lower the boom to overcome inertia of the boom weight. Very little power is required to move the load toward or away from the crane. Mounting can be on either a stationary or movable gentry. Supporting structure is the pintle type, consisting of a rotating mast inside a non-rotating tower. Capacity is four tons. American Hoist & Derrick Co., St. Paul 1, Minn.

Coating Materials

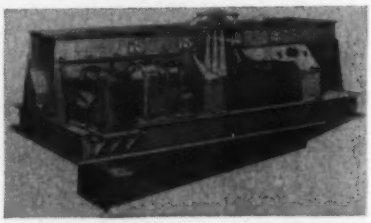
Versatile sealers and finishers for wood and plastics.

To moisture-proof and rot-proof oak flooring and other wood products, application of Tuf-On #630-F fungicide sealer not only reinforces and fungus-proofs, but acts as a beautifier to bring out texture of the wood grain.

Tuf-On Filaplast, for fiberglas and plastics, performs the dual function of adhering to fiberglas and plastic surfaces, and of filling indentations where they occur on the surface. This coating may be applied by putty-knife or squeegee, or thinned for spray application. Brooklyn Varnish Mfg. Co., 50 Jay St., Brooklyn 1, N.Y.

Hydraulic Barker

Designed for interior accessibility and for ease in dismantling and assembly.

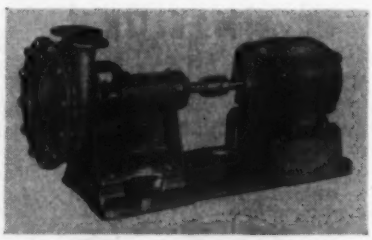


Streamlined Streambarker is able to handle logs up to 24 inches in dia., an increase of 6 inches over the old model. Lower main barking compartment, larger entrance and discharge with more rigid construction, are among the unit's new features. Entrance to the machine is through two large doors in the sloping portion of the sides, allowing less chance for water passage to the outside.

Baffle cylinders have been placed within the barker in a horizontal position, and new oil controlled cylinder permits more accurate control of crooked and limby wood. Larger reduction gears in the variable speed units have also been added. Base of the barker is low of one piece rather than being bolted at the buckhorn chain and roll junction. Allis-Chalmers Co., Milwaukee, Wis.

Stainless Steel Pumps

Designed for handling corrosive liquids in the process and other industries.



Stainless steel centrifugal pumps were designed to provide the process industries with a complete line of dependable centrifugal pumps for handling those acid and alkaline liquors for which standard iron or bronze pumps are not suitable because of the corrosive or abrasive qualities of the material being pumped. Outstanding features are that the stuffing box is on the suction side of the impeller, both suction and discharge connections are located in casing. Should wear eventually occur between impeller vanes and the casing, provision is made for adjustment of clearance between these two parts. Goulds Pumps, Inc., Seneca Falls, N.Y.

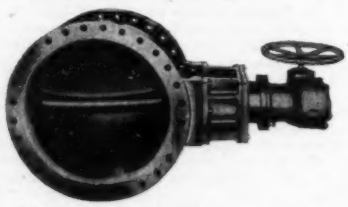
Floodlights

Can be used for all general-purpose applications.

These weather-tight and well constructed floodlights are available in two types: Type L-84 rated at 500 watts and Type L-85 rated at 1000 watts. They can be used for either general lighting service or floodlighting service lamps. An auxiliary reflector of finished aluminum provides high beam efficiency. Both types are available in three standard mountings, including a portable base. General Electric Co., Schenectady 5, N.Y.

Rubber Lined Valve

Easily adapted to automatic control.



This 30-inch, 50-lb. cast iron valve equipped with 125-lb. flanges and a renewable one-piece rubber seat for positive shut-off, is air bubble tight at 80 psi and drip tight with water at 100 psi. Used efficiently in the temperature range from minus 20 to plus 200 F. Packing difficulty is eliminated due to oscillating motion of valve shaft. R-S Products Corp., Wayne Junction, Philadelphia 44, Pa.

Cation Exchanger

Effective in the recovery of antibiotics.

This carboxylic acid type cation exchange resin known as Amberlite IRC-50 possesses versatility, making it widely applicable in the process industries. Buffered, it absorbs selectivity such amphoteric substances as amino acids, growth factors and peptides. In medial therapy, its white, beaded form makes it especially interesting as a modifier of internal salt balances and as a carrier of antispasmodics. It also will adsorb cationic

LIGHTNIN Mixer gets results

FOR WEST COAST PULP MILLS . . .

Fluid Blending and Solids Suspension Problem— One of Many Solved by Mixco Engineered Agitation

PROBLEM: A large West Coast pulp mill desired to blend two miscible liquids to uniformity, and to maintain a uniform suspension of the precipitated crystals formed.

Total flow rate of both components was 380 GPM. The light component (13% by volume), had a sp. gr. of 1.25 and viscosity of 1 cp. The heavy component (87% by volume) had a sp. gr. of 1.25 and viscosity of 100 cpp. Solids formed amounted to approximately 2 lbs. per gallon, with sp. gr. of 2.50. Particle size determined the maximum settling rate at 20 FPM.

The wood tank used measured 7 ft. in diameter by 7 ft. straight side depth, with total capacity of 1740 gallons. Operating level in the tank was 6' 6", giving a retention time of approximately 4.2 minutes and a batch of 1600 gallons.

SOLUTION: Analysis of the above factors led to selection of a Model ID-WQ-300 3 H.P. LIGHTNIN Top Entering Agitator, designed for open tank operation. The unit was equipped with a single 26-inch diameter 4-blade flat blade turbine, operating at 90 RPM. All wetted parts of the agitator were supplied in Type 304 Stainless.

Four vertical baffles, each 7 inches wide, were installed in the tank to give a flow pattern that would accomplish the desired results. Shaft length required on the mixer was 6'4". MIXCO critical speed data indicated that satisfactory operation would be obtained without using a stabilizing ring or step bearing in the bottom of the tank, even though the mixer was to be operated while filling and drawing off.

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LIGHTNIN PORTABLE MIXERS
Electric or air motors; direct or gear drive. Capacities ⅛ to 3 H.P. Send for Catalog B-75.

LIGHTNIN SIDE ENTERING MIXERS
For tanks up to 5 million gallons capacity. Gear drive, Vee-belt drive, and motorless types. Send for Catalog B-76.

LIGHTNIN TOP ENTERING AGITATORS
Turbine, propeller or paddle type. For open or closed tanks. Capacities, ¼ to 100 H.P. Send for Catalogs B-89, B-78.

LIGHTNIN Mixers and Agitators are used for feed water conditioning, stock chest agitation, clay slurry preparation, and wherever agitation is needed. MIXCO engineers have a 25-year backlog of experience . . . plus exclusive mixing data that enables us to predict process results accurately. Every installation is *guaranteed*. For help on any fluid agitation requirement, call your nearest MIXCO representative, or write direct.

MIXING EQUIPMENT CO., Inc.

(MIXCO)
1035 Garson Ave., Rochester 9, N. Y.

In Canada:
William and J. G. Greey, Ltd., Toronto

NEW LIFE FOR AN OLD ROLL

WELDCO COVERS ADD 2 TO 3 TIMES MORE SERVICE LIFE!

BEFORE — what a core! Notice the worn, rough, pitted surface.

NOW — a new roll . . . better than the original . . . covered by a solid layer of rolled metal!

The Weldco covering process can be used for both new and reclaimed rolls, eliminating the cost of new cores and providing substantial savings. Available in Monel, Stainless Steel, Nickel and other alloys, Weldco Rolls resist corrosion, withstand abrasion, and give long, economical service.

Investigate this patented process that provides a solid layer of rolled metal, applied to the base roll uniformly and tightly. Let Weldco roll specialists advise you on the best materials for your roll and processing requirements.

THE YOUNGSTOWN WELDING & ENGINEERING COMPANY

3700 OAKWOOD AVENUE . . . . YOUNGSTOWN 9, OHIO

fungicides, deodorants, dyes, inks and amine type age-resistors. IRC-50 is also claimed to possess extremely high capacity in alkaline media. Resinous Products Div. of Rohm & Haas Co., Philadelphia, Pa.

Control Valve

Has quick reversibility of action.

Without the use of special tools, the Stabilflo valve can be changed from "air to open" to "air to close," or vice versa; and it is not necessary to remove the valve from its installation or to shut down the controlled flow. The quick and easy reversibility feature of the new Stabilflo valve means time-saving where changes must be made in existing installations, convenience in test work or pilot plant operation, and simplification and reduction in the stock of spare valves which the average plants keep in reserve. The Foxboro Co., 158 Neponset Ave., Foxboro, Mass.

Fork Truck System

Does away with the use of pallets.

The Pak-Loader fork truck system comprises two components, namely fork trucks equipped with pusher mechanisms and two or three specially adapted steel plates per fork truck. Boxes, barrels, bales, drums, and cartons can be handled in multiple units, and the system is most advantageous where large quantities of goods are stored and when goods are customarily shipped unpalletized. The truck can be used as a regular fork truck for handling skids and pallets when both pallet (or skid) and non-pallet non-skid operations are employed. The Yale & Towne Mfg. Co., Philadelphia Div., Roosevelt Blvd. & Haldeman Ave., Philadelphia 15, Pa.

Instrument Valves

For equipment which is accompanied by an instrument valve.

Forged steel instrument valves that are particularly useful to manufacturers of meters, gauges, pumps, regulators, and other small control equipment are ideal for providing close regulation on small lines. Built of stainless steel, they have the added advantage of resistance to many of the corrosive influences found around chemical processing and petroleum refining plants, and also are quite useful on steam sampling systems where it is important that the feed sample not be contaminated in any way. Available in globe or angle design in ¼, ⅜, and ½-inch sizes with screwed or socket welding ends. Edward Valves, Inc., East Chicago, Ind.

Motors

Designed for all-angle operation.

The lifetime oil-lubricated, shaded-pole motors designated as Type KSP can be used as drives for exhaust fans, cooling fans, evaporative coolers, unit heaters, condenser cooling, and space heaters, as well as for small pumps, agitators and blowers. Available in either open or totally enclosed construction. Ratings range from 25 1/40 hp. through 1/12 hp. at 115 or 230-V, 1050 or 1550 rpm, 60 cycles. Oil saturated packing continuously feeds the bearing with filtered oil, no additional lubricant is required. General Electric Co., Schenectady 5, N.Y.

Air Conditioning

Humidity method controls temperature and relative humidity.

The controlled humidity method is a system of air conditioning wherein dry air at normal atmospheric temperatures is provided with little or no refrigeration required. It is claimed that a condition of 15 grains of moisture per pound of air at 85 F. dry bulb temperature has been produced without refrigeration. The apparatus is enclosed in a casing through which the air is drawn by fans, and is manufactured in a range of sizes providing from 1,000 to 20,000 cfm of conditioned air from a single unit, Niagara Blower Co., 405 Lexington Ave., New York 17, N. Y.

Chemical Pumps

Special diaphragm provides resistance to chemicals.

New chemical pump, No. 777, has a special diaphragm made of heavy cross weave cord, plastic coated on both sides, that stands up unusually well to most fluids. The pump is especially adaptable to lacquer thinner, synthetic thinner, turpentine, acetone, benzene, benzol, perchlorethylene, trichlorethylene, detergent oils, linseed oils, stoddards solvent, etc. Plated parts prevent corrosion. General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia 32, Pa.

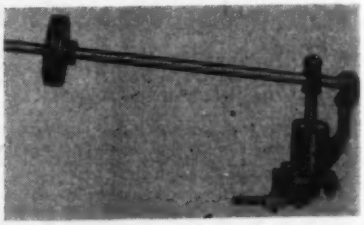
Combustion Safeguard

For industrial and commercial heating equipment.

The Flame-otrol uses the flame itself as the "electronic link" in a simple electronic circuit to provide instantaneous switching action. It is capable of detecting the presence or absence of a gas or oil flame of any type of burner eliminating the need for costly, especially designed equipment. It is claimed that a complete selfchecking cycle of operation from safe-start to safe-shutoff for any type of gas or oil fired heating equipment is provided with this instrument. Wheelco Instruments Co., 847 W. Harrison St., Chicago 7, Ill.

Lubricator

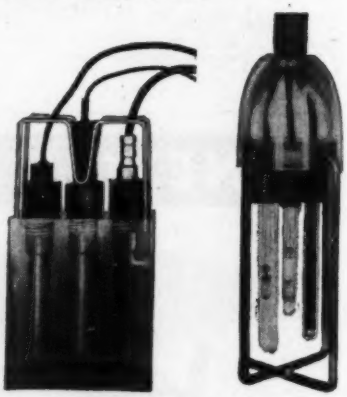
Delivers lubricant at constant pressure in any desired quantity.



Weight-loaded lubricator may be used for greases and oils, and it is claimed the unit will decrease maintenance costs, improve equipment operation and lengthen machinery life. Typical uses are application of lubricant to stuffing boxes of pumps and mixers, motors and engines, heavy machinery, farm machinery, line shafting bearings, motorized and lubricated valves. Because weights of different values may be used, pressures may be applied to lubricants up to 150 lb. psi. Replenishment of lubricant may be done without disassembling the lubricator. Mixing Equipment Co., 1024 Garson Ave., Rochester 9, N.Y.

pH Electrodes

Feature waterproof design.



Two plastic pH electrode assemblies, one for continuous sampling lines and the other for immersion in open channels and tanks, are available. Sampling line assembly has low capacity which permits a high flow rate and minimizes the coating of electrodes by suspended material. Immersion unit can be used at a depth of ten feet, or greater with longer lead wires. Electrodes and temperature compensating elements are new features of these units. Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.

Lift Truck

Easier handling by one man of skid and pallet loads up to 6,000 lb.

Single frame truck has a compactly packaged hydraulic system in a streamlined housing. The hydraulic pumping unit is self-contained. There are no oil lines. Another improved characteristic of this new lift truck is high underclearance, which makes it suitable for loading and unloading motor trucks, and for other conditions where short, steel

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HANCHETT MAMMOTH AK

KNIFE AND SHEAR BLADE GRINDER

World's finest heavy-duty traveling wheel grinder for high speed grinding with extreme accuracy and efficiency. Fully equipped to your own specified requirements. Can be furnished in either built-in motor drive or V-belt drive.

Widely used for paper, planer, hog, barker, chipper, and veneer knives. AK grinds flat or concave bevel on any desired angle or square edge. Built in lengths from 84" to 350" and longer when required.

AK

Write for complete data PI-40.

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World's Largest Manufacturers of Saw Sharpening and Knife Grinding Machinery

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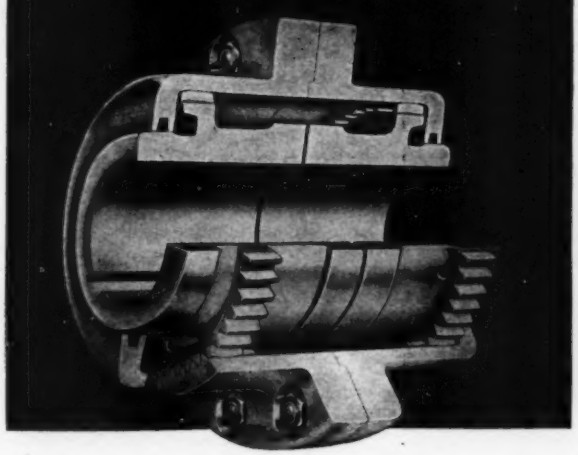

A COPY OF CATALOG GIVING FULL DESCRIPTION AND ENGINEERING DATA SENT UPON REQUEST.

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POOLE FOUNDRY & MACHINE COMPANY WOODBERRY, BALTIMORE, MD.

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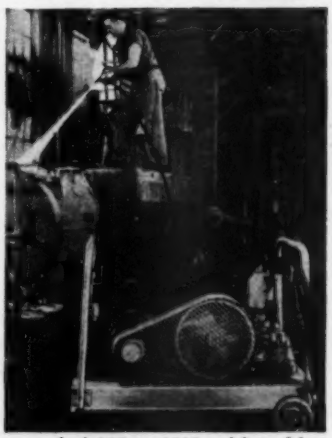

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Here's a time-saving, money-saving, *completely portable* High Pressure Cleaning Unit that does a *better* job of cleaning screen slots on Bird screens, washing out holes on suction couch and press rolls, removing white scale and other incrustations from vats, quick cleaning of Fourdrinier after wire is removed! Cleans walls, floors and equipment faster, easier! 300 to 1000 psi-jet of hot or cold water washes away refuse, residue and debris without harming machinery. Praised by users everywhere for its efficiency, portability and ease of operation! Two sizes . . . 10 gal. per minute pump with 1 gun or 20 gal. per minute with 2 guns.

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HI-PRESSURE CLEANERS

JUICE PRESSES • SPRAY COOLERS
PASTEURIZER COOLERS • CONVEYORS
TRIMMING TABLES • HYDRAULIC PRESSES

ramps are employed. Unit has a load capacity of 6,000 lb. and is built in widths of 20 and 25 inches, with platform lengths from 36 to 72 inches. It is also available in a twin-forked model for handling pallets. Barrett-Cravens Co., 4609 S. Western Blvd., Chicago 9, Ill.

Maintenance Paint

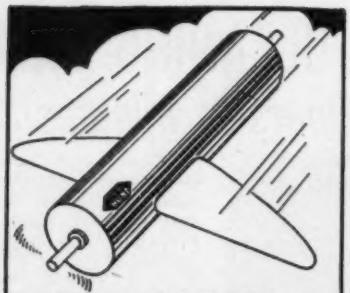
Based on chlorinated rubber.

Chemical resistance of a new paint, Ucilon 1701, has been so designed to be of service where ordinary oils or oleoresinous paints are not or have not proven satisfactory. The manufacturer recommends it as a coating for floors, walls, ceilings, exteriors of storage tanks, structural steel and exteriors of certain process equipment and machinery in industrial atmospheres. Available in a full range of colors. United Chromium Inc., 51 E. 42nd St., New York 17, N.Y.

Spacer Cutter

Hydraulically-operated and electronically-controlled.

A hexagonal bar on the automatic spacer cutter permits six complete individual set-ups for cutting, thus eliminating the need for manual adjustments. Each set-up contains all the electronic signals necessary for any one series of cuts. Any number of cuts and trim-outs can be set, limited only by the size range of the machine. Unit is designed for the Lawson 46 in. and 52 in. hydraulic clamp cutters. E. P. Lawson Co., New York, N. Y.



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FOR WET FELTS

plus patented features that give greater value.

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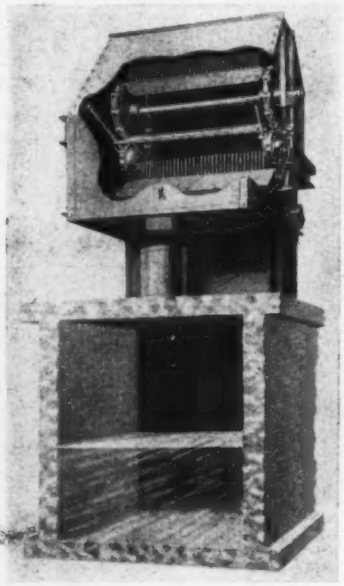
RODNEY HUNT MACHINE COMPANY

38 Maple Street, Orange, Mass., U.S.A.

Bar Screen

For removing trash and large solids from water.



Screen bars are mounted vertically on the Thru-Clean bar screen thus requiring a minimum of floor space. Jamming or clogging the bars is practically eliminated because the rake teeth travel upward through openings between the bars from the downstream side of machine. Screenings are discharged on the upstream side of screen rack to a belt conveyor for disposal, or into a trough. The machine is operated by a Gearmotor and encased "RC" roller chain drive connecting with its head shaft. Operation may be automatic by means of a time clock, or manually by pushbuttons. Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill.

Hand Truck

Equipped with hydraulically operated fingers for picking up cylindrical containers.

Drums, cardboard containers and kegs can now be picked up without the use of pallets or skids with this battery powered hand truck. Hydraulically operated fingers grasp the load from above and suspend it for handling rather than support it from below. The truck tiers from 1 to 6 cylindrical containers 2, 3 and 4 layers deep. Weight is 3,845 lb., over-all height 83 inches. Operation of fingers is controlled by levers located at the front of truck. Forward and reverse speeds are controlled from the handle. When steering handle is in either the vertical or horizontal position, the truck brake is automatically applied to prevent accidental movement. The Yale & Towne Mfg. Co., Philadelphia Div., Philadelphia, Pa.

Power Shovel

Easily converted to trench-hoe, dragline or clamshell.

The new Model "L" is a one-half cubic yard power shovel, or ten ton capacity crane, equipped with heavy duty 30-foot folding-type boom. It is powered by an International U-9 motor developing 55 brake hp., the basic machine weighing 12,000 lb. Standard equipment includes drum lagging, hold-in clutch levers with the same operational function as "snap-in" or "toggle-in" clutches, and a combination power trip and automatic tagline winder. "Quick-Way" Truck Shovel Co., Denver, Colo.

Tachometer Generator

Operates in either direction.

Heavy duty d-c tachometer generator is for accurate speed measurement of steel and aluminum mill machinery, mine hoists, crushing and shipboard equipment, wire-forming machines, papermill drives, etc. The unit is available in three models, is totally enclosed and features rubber-mounted ball bearings and an alnico permanent-magnet field. Clockwise and counterclockwise rotation can be indicated by a zero-center instrument. The unit may be mounted either vertically or horizontally. General Electric Co., Schenectady 5, N.Y.

Pipe Insulation

Can be cut and fitted rapidly with ordinary tools.

Especially suited for cold pipe insulation, K-Shield is made of Styrofoam, an expanded plastic containing thousands of minute closed-wall cells. Although airy looking, and weighing approximately 1¼ to 1½ lb pcf, it is a highly workable rigid material which is its own moisture barrier. Other outstanding properties are resistance to mold growth, rot and decay. It is being used in cold storage units, chemical processing plants, oil refineries and in special applications on pipe lines where temperatures range from 175 F. to minus 250 F. The Dow Chemical Co., Midland, Mich.

Surface-Active Agents

Function as dispersing agents for association polymers of high polarity.

Hypodynes comprise dispersing and surface-active agents which are acid esters of selected polybasic acids and their respective amine salts. They have been found to exhibit surface tension lowering and interfacial tension lowering comparable to that produced by highly active surface-agents. The outstanding ability of these materials to disperse aggregates or micelles of polar substances, especially in organic systems, is claimed superlative as compared with that of numerous commercially available chemicals of many types. The unsaturated nature of the compounds make them attractive in formulations of film-forming materials, such

GET YOUR COPY

If you haven't already received a copy of this new bulletin on Bauer Pulp Refiners, we'll be glad to mail you one. The bulletin explains the construction and performance of Bauer No. 400 Series Pulp Refiners. It gives complete dimensions and data. It describes modified designs for special services, also auxiliary equipment. While you're thinking of it, ask for Bulletin P-1.

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"Go to Work"

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For an impressive pictorial story with the pertinent facts you will want to know, write for the Pulpwood Grapple Catalog.

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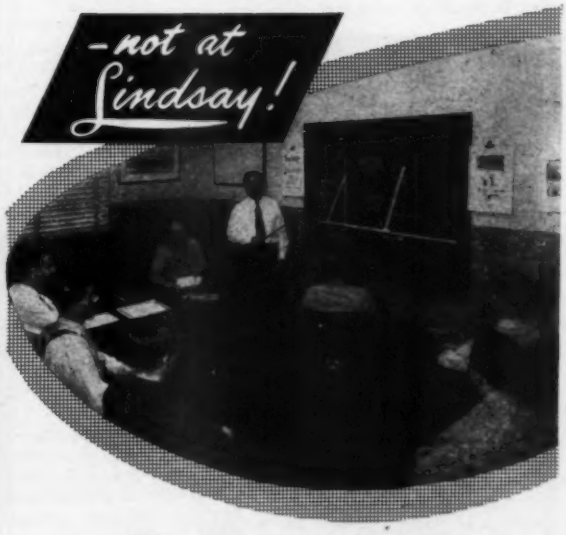
"TAKE A CHANCE?"



Many safety meetings help to keep our plant in continuous operation in order that your plant, too, may encounter no down-time.

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Lindsay **WIRES**
FOR PAPER MILLS

as specialty drying oils, alkyds and other polymeric synthetics, since they tend to eventually become an integral, though small, part of the system involved. Ferro Chemical Corp., P. O. Box 76, Bedford, Ohio.

Handwheel Valve

Eliminates the necessity of the conventional by-pass.

Travel limit stops can be set to limit the valve stroke from 0 to 100 per cent with the continuously connected handwheel control valve. For example, a 25 per cent valve travel can be located at any point in the valve stroke from fully closed to fully open. The handwheel can be used to shut the valve tightly or block the valve wide open. Valve plug position indicator automatically indicates the valve plug position, and shows the setting of the travel stops. It shows at all times the per cent free travel of the valve plug, and in what portion of the valve stroke the free travel can occur. It also shows whether the handwheel is in a neutral position. Hammel-Dahl Co., 243 Richmond St., Providence 3, R. I.

Bladeless Trash Pump

Reduces maintenance and operating costs and is practically clog-free.

No vanes or blades in this pumping unit for handling trash and sewage. The impeller is bladeless, and fluid passes through it through a single rotating channel or passage way with the centrifugal force doing the work. The pump will handle much larger trash, particularly of the fibrous type, than will conventional sewage pumps having blades in the impeller. Diameter of the rotation channel at its narrowest point is equal to the diameter of the inlet pipe; hence almost anything that will enter the eye of the pump will be carried through without clogging. Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Ill.

Briefs . . .

▶ ELEVATING POSITIONER — Hydraulic elevating positioners are offered in several models, each having an elevating mounting plate so arranged that various types of fixtures can be installed. Units can be operated by hand pump, foot pump, electric power, or air operated pump. Lyon-Raymond Corp., 8058 Madison St., Greene, N.Y.

▶ STARCH PASTE—Use of Flovis, a new anti-gelling agent, in starch pastes gives creamier, smoother and softer products which are easier to use and handle. No reduction in solids content is necessary to get better flow. Manufactured on a tonnage basis. Glyco Products Co., 26 Court St., Brooklyn 2, N.Y.

▶ SEALING ADHESIVE—Unusual features of this heat sealing adhesive are the low pressure required to cause sealing as well as the low time of contact necessary. It can be coated on or sealed to paper, cellophane, plain or waxed glassine, waxed paper, and other sheetings without the use of heat. Polymer Industries, Inc., 11-08 30th Ave., Astoria, N.Y.

▶ FIRE EXTINGUISHER—2½ gal. Foamite fire extinguisher for vehicular fire protection has an ultimate shell strength of 1400 lb. psi and is claimed to be 65 per cent stronger than any previous drawn-shell model, twice as strong as a welded silicon bronze unit, 2½ times as strong as a fabricated copper unit. Ideal for tank trucks and other large vehicle units because it produces a fire-killing chemical foam equal to approximately 10 times its own capacity. Stops oil and gasoline fires and prevents reflashing. American-LaFrance-Foamite Corp., Elmira, N.Y.

▶ GRADING-FORK ATTACHMENT — Gravity-dump grading fork is applicable to all models of Clark fork-lift trucks of 2,000 lb. capacity and up, and is readily interchangeable with standard forks and attachments for mounting on standard uprights. Fork has ¾ in. dia. removable tines spaced on 1 in. centers. Industrial Truck Div., Clark Equipment Co., Battle Creek, Mich.

▶ STEEL HOSE—Flexible stainless steel hose provides corrosion resistance in sulphonation and other processes which cause the formation of sulphuric, formic or acetic acids and other highly corrosive agents. Size range is from about 1 inch I.D. to 2⅝ inch I.D. in various gauges. Alloy Tube Div., The Carpenter Steel Co., Union, N.J.

▶ SPROCKETS—Baldwin-Rex improved tooth form sprockets are claimed to lengthen roller chain drive life up to 50 per cent. Composed of a root circle, straight working faces tangent to root circle and topping curves which bring the tooth to a point. Gap angle is a predetermined variable, designed according to the number of teeth, to assure most efficient chain action. Chain Belt Co., 1600 W. Bruce St., Milwaukee 4, Wis.

▶ HEALTH PROTECTION—Claimed to reduce sickness absenteeism by killing a high percentage of air-borne germs and virus, at the same time banishing practically any odor, the Ozium formula (incorporating both Propylene Glycol and Triethylene Glycol) provides health protection for all those who come in close proximity to others. Dispenser is chrome-plated, fits snugly into the hand, and pressure-packed Ozium refills can be quickly and easily inserted. Woodlets, Inc., Portland, Pa.

▶ MOLDING COMPOUNDS — Three Hycar phenolic molding compounds consisting of an asbestos-filled, cotton flock-filled, and fabric-filled, have unusual shock, vibration, and fatigue resistance, plus characteristics of the filler material. Tests indicate that parts molded from these compounds will withstand severe mechancal abuse after cracking before complete failure occurs. General Electric Co., Pittsfield, Mass.

▶ GROUND CLAMP—Adjustable ground clamp consits of a flexible, perforated pure copper band which encircles the pipe. Claimed to be foolproof, vibration proof, to give trouble-free service. Blackburn Specialty Co., 6541 Euclid Ave., Cleveland 3, Ohio.

▶ FLEXIBLE METAL TUBING—Designed for conveying grain, rough forage, slag, insulation and other granular materials. Fabricated from galvanized steel strip. Abrasion-resistant feature reduces friction and allows free smooth flow of material with minimum of clogging and work stoppage. Chicago Metal Hose Corp., 1302 So. 3rd Ave., Maywood, Ill.

▶ CABLE REEL TRUCK—Capable of handling reels of various diameters and widths without requiring any adjustment. Lifting arrangement incorporates two hydraulic hoists which raise the carrying arms of the truck. Different truck capacities range from 2,000 to 10,000 lb. Lyon-Raymond Corp., 8063 Madison St., Greene, N.Y.

▶ CONDUIT BENDER — Thin-wall conduit bender, known as model S-34, consists of the 10-ton S-71 hydraulic unit and S-35 assortment of attachments. This bender offers remote-control, all-directional operation, and extra utility when hydraulic unit is detached from the bending frame and used with standard maintenance attachments as a general use jack. Blackhawk Mfg. Co., Milwaukee 1, Wis.

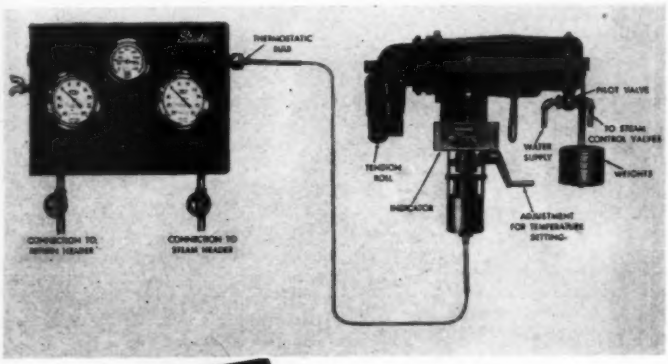
▶ GAS WELDING MASK—Especially designed for gas welding, cutting and brazing. Multiple adjustment assures proper fit. May be worn over prescription glasses. Extruded plastic headgear and cross strap over top of head are moisture proof, will not shrink or warp, and may be sterilized. General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia 32, Pa.

▶ COATINGS—Strip-Ease is a new wax-base coating for concrete forms, said to be suitable for use on old or new lumber forms, regular or special-surface plywoods, and metal forms. Can be used as a rust-preventive on machinery, equipment and metals. Unacote is a fast-drying finish for practically any surface or material. Bends over a ¼ in. radius without cracking, making it usable for leather, rattan and similar applications. On metals, it is an effective tarnish and rust preventive. Arnaud Corp., 17 John St., New York 7, N.Y.

"Savings in steam alone about $80.00 a day!"

$80.00 a day . . . $400.00 for a five day week . . . better than $1600.00 every month! That's the savings effected **in steam alone** by an eastern paper mill since installing Stickle Automatic Tension and Thermal Controls on its machines. But that's not all! Listen to these actual results reported by the user:

"We have been able to control moisture to ½ of 1% and maintain this through the entire operation. This has allowed us to increase the moisture content of our paper and hold this uniformity from day to day. Paper waste and rejections have been cut **10%.** Uniform paper now goes to our finishing department without the wrinkling we had before."



Stickle Automatic Tension and Thermal Control (illustrated at left) is designed to save you money in the manufacture of paper . . . primarily by accurately controlling sheet moisture within the closest possible limits . . . stabilizing steam flow to the machines . . . checking overheating of the dryers . . . eliminating manual control to the greatest degree. Results are positive—**lower fuel costs, fewer rejects, consistently higher quality of product.** Send for **free** Stickle Bulletin 160 PI, describing Stickle Automatic Tension and Thermal Control and other Stickle Steam Equipment, designed to cut the costs and improve the output of Paper Mills throughout the industry. **Do it today.**

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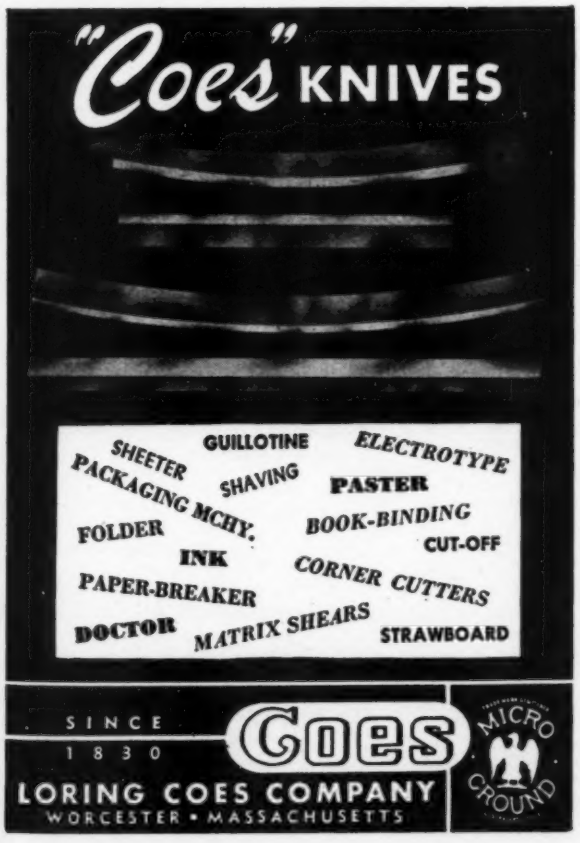

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The Paper Industry New Literature

Books

TRANSFORMER PRINCIPLES AND PRACTICE. By J. B. Gibbs. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N.Y. 232 pages. $3.50.

This second edition deals with all aspects of the construction and use of transformers, including underlying principles, applications, connection, testing, care and economics, and includes a new chapter on current-limiting reactors, plus new illustrations. The first of the 24 illustrated chapters introduces the subject by way of fundamentals of transformer performance and construction. Following this are descriptions of many particular types of transformers for various purposes. Transformer connections, phase transformation, polarity, ratio adjustment, mechanical forces, and other subjects are dealt with in details.

AQUAMETRY. By John Mitchell and Donald Milton Smith. Published Interscience Publishers, Inc., 215 4th Ave., New York 3, N. Y. 1948. 444 pages. 6x9. $8.00.

This book, fifth in a series on chemical analysis, makes available to analytical chemists the various applications of the Karl Fischer reagent in quantitative analysis involving H_2O. The book is divided into two main sections, one discussing the specific quantitative determination of water by the Karl Fischer reagent, and the other, organic reactions involving liberation or consumption of water. Each chapter has numerous illustrations and charts, along with the usual chemical formulas and equations, that make the material at hand much easier to understand.

FUNDAMENTAL PROCESSES OF DYE CHEMISTRY. By Hans Eduard Fierz-David & Louis Blangey. Translated from the 5th Austrian Edition by Paul W. Vittum. Pub. by Interscience Publishers, 215 4th Ave., New York 3, N.Y. 479 Pages with illustrations. 5¾ x 9. $9.50.

The main aim of this book, as in the four previous editions, is to explain the fundamental principles of dye chemistry. The book is divided into six sections, with the majority of discussion taken up with compounds of the benzene, naphthalene, and antraquinone series and the fundamental dyes, such as azo, indigoid, and anthraquinone. There is also an informative section on the technical deails of processing in the manufacturing of dyes.

Frequent illustrations and diagrams, showing the chemical reactions, structural formulas, and various apparatus discussed, aid the reader in his comprehension of this work. Nearly fifty pages are devoted to charts showing the derivations and reactions of various key compounds.

INDUSTRIAL CHEMISTRY. 5th Edition. By E. Raymond Riegel. Published by Reinhold Publishing Corp., 330 W. 42nd St., New York, N. Y. 1949. 1015 pages. $7.00.

Chemical technologists and specialists will find this revised new edition a complete, informative, accurate and readable survey of the whole field of industrial chemistry. The many pages of text and illustrations cover plants, equipment, machinery, material and processes in over fifty chemical and process industries.

New material includes antibiotics, new organic insecticides and fungicides, utilization of wood, novel methods of the application of dyes to fiber, atomic energy, and recent developments in plastics and petroleum. All text has been brought up to date. Large portions of many of the chapters have been replaced by the description of current processes.

There is a total of fifty chapters. A statistical table of chemical and allied manufactures is included in the forepart of the book. The appendix includes a table of the more important chemical elements with symbols and atomic weights, table for conversions, tables on specific gravity equivalents for degrees, Baumé for liquids heavier than water and for liquids lighter than water, and diesel fuel standards with a graph drawing of related properties of Diesel fuels.

BEST'S SAFETY DIRECTORY OF SAFETY, FIRST-AID, HYGIENE AND FIRE PROTECTIVE PRODUCTS: 1950-1951. Third Edition. Published by Alfred M. Best Co., 75 Fulton St., New York 7, N. Y. 8½ x 11. 511 pages. $5.00.

Safety, fire protection and control, hygiene, first-aid and sanitation are covered in this directory, showing what safety products or devices to use for specific hazards, how to use them, and where to get them.

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Advertisements of safety equipment distributors are classified geographically, and an index is provided for both products and advertisers. All in all, this comprehensive volume combines the best practical features of a safety manual, directory, index, encyclopedia and catalogue.

Booklets and Pamphlets

THE FATIGUE ALLOWANCE IN INDUSTRIAL TIME STUDY. By Matthew A. Payne. Obtained through M. A. Payne, 13777 Euclid Ave., E. Cleveland 12, Ohio. 66 pages. $2.50. Booklet contains 65 quotations and 85 references. Presents and discusses problems associated with the purpose, determination and application of the fatigue allowance in industrial time study, and includes industrial engineering opinions concerning the fatigue allowance and its effect upon workloads, fair day's work, man power and incentive assignments.

BI-MONTHLY SUPPLEMENT TO ALL LISTS OF INSPECTED APPLIANCES, EQUIPMENT, AND MATERIALS. Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago 11, Ill. 80 pages. This supplement contains listings established subsequent to preceding Bi-monthly Supplements or to a preceding respective Annual List, all for which must be consulted in conjunction with this booklet in order to obtain complete information relative to names of manufacturers and appliances listed.

AMERICAN MANAGEMENT SERIES. Published by American Management Association, 330 W. 42nd St., New York 18, N. Y. Welfare Issues in Collective Bargaining presents papers given at the Fall Personnel Conference of AMA. Price, $1.00. Developments in Social Security and Workmen's Compensation contains papers presented at the Insurance Conference of AMA. Price, $1.00; Labor Relations and Political Action—The Challenge to Management—contains papers presented at the General Management Conference of AMA. Price, 50c; and, Improving the Efficiency of Packaging Production (Price, 75c) and

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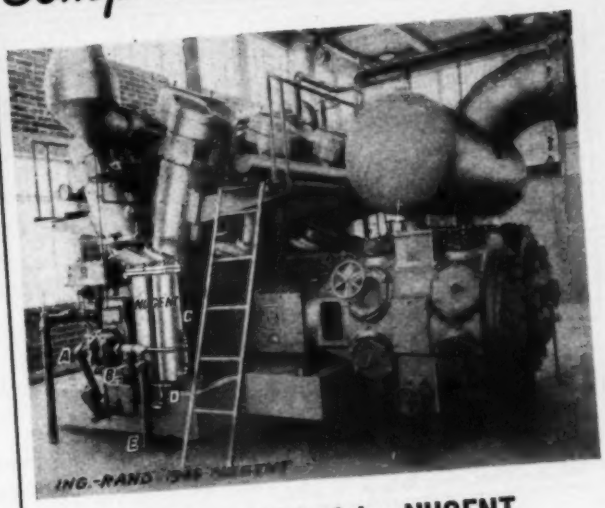

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Through the co-operation of manufacturers and suppliers, THE PAPER INDUSTRY *lists the following catalogues, bulletins, and booklets. They may be obtained without cost or obligation, unless otherwise specified, by writing direct to the manufacturers. Please address requests on your company letterhead.*

Pipe Fittings. Maurice A. Knight Co., Kelly Ave., Akron 9, Ohio—4-page Bulletin No. 1 describes and illustrates with diagrammatic sketches, permanite pipe and fume duct fittings. Dimensional tables, physical properties of permanite, and meaning of symbols for chemical resistance are given.

Recording Instrument. Consolidated Engineering Corp., 620 No. Lake Ave., Pasadena 4, Calif.—4-page Bulletin 1810A describes and illustrates the Titrilog application for the continuous recording of trace quantities of sulphur compounds. Specifications and rental service information are included.

Self-Lubricating Packings. Greene, Tweed & Co., North Wales, Pa.—4-page Bulletin LP-10 covers the principles of self-lubricating packing design, structure and performance as well as analysis of each individual packing from standpoint of application to specific services. Packing illustrations and specifications are also included.

Laboratory Mixer. Brookfield Engineering Laboratories, Inc., Porter St., Stoughton, Mass.—Pocket-size 3-way folder contains descriptive material of the Brookfield counter-rotating mixer. Specifications are included.

Water Jet Eductors. Schutte and Koerting Co., 12th and Thompson Sts., Philadelphia 22, Pa.—36-page Bulletin 2-M pictures and describes the complete line of SK Water Jet Eductors for use in lifting, pumping, mixing and agitating of liquids and the handling of solids and slurries at low cost. Photographs, sectional drawings, tables with dimension drawings, and colored flow diagrams are shown.

Packaging and Paper Lacquers. Hercules Powder Co., Wilmington, Del.—32-page booklet includes a description of the formulations and materials used in the research and detailed results on nitrocellulose packaging and paper lacquers. Sixteen charts and graphs illustrate and supplement the text. Sections on heat-sealing coatings and moistureproof heat-sealing coatings are included, as well as suggested starting formulations for paper-coating lacquers. Explanation of testing methods and description of lacquer components, solvent, paper-coating method, and coating cycle used in the research are cited.

Rubber Linings. The B. F. Goodrich Co., Akron, Ohio—6-page Catalogue Section No. 9020 describes and pictures the process for locking rubber to metal, and discusses the materials used in various types of standard linings and recommended uses. Tables show acids which can be safely and economically handled by rubber linings and give storage tank dimensions ranging from 225 gal. to 30,000 gal. Data on comparative costs of acid storage in rubber-lined equipment versus the carboy is included.

Fuel Cost Chart. Roy Emmert Associates, Westerlo, N. Y.—Chart entitled "Management Influence on Fuel Costs" shows three plants of like size and similar basic equipment, and brings out the difference they pay on fuel requirements according to the interest and competence of management. Technical details of operation in the three plants, together with both used and wasted fuel by percentage are given.

Precipitators. Western Precipitation Corp., 1016 W. 9th St., Los Angeles 15, Calif.—Bulletin entitled "Facts of Interest To Every Paper Mill Operator . . ." highlights facts concerning the installation of Cottrell equipment in paper mills. Electrical precipitator features are given. Diagram of actual precipitator installation superimposed on cascade evaporator is shown.

Disc Clutch. Edgemont Machine Co., Dayton, Ohio—12 page Bulletin SF-5 describes and illustrates type SF disc clutches, and how they are used. Price list and data, parts list, hp ratings, and diagrammatic sketches are given.

Instrument Valves. Edward Valves, Inc., Sub. of Rockwell Mfg. Co., East Chicago, Ind.—4 page Bulletin No. 491 provides information on new drop forged steel instrument valves for meter, gauge, instrument and other small lines. Illustrated. Dimensions, weights, prices and operating data included.

Steel Hardening Compound. Wilson Carbon Co., Inc., 60 E. 42nd St., New York 17, N. Y.—4-way Bulletin No. 11 contains a new method of case and depth hardening mild steel with activated carbon-chromium steel catalyst. Illustrated, with graphs and pictures.

Fork Trucks. Yale & Towne Mfg. Co., Roosevelt & Haldeman Ave., Philadelphia 15, Pa.—Two-color, 4 page folder gives 25 hints on how to operate gas trucks safely and with a minimum of wear to moving parts. Each is illustrated with a small drawing.

Gages. Pratt & Whitney, West Hartford 1, Conn.—Folder entitled "8 Ways of Gaging Your Products Continuously" covers gages applicable to certain fields of sheet material manufacturing. Photographs of equipment are shown.

Steel Equipment. Precision Equipment Co., 3714 N. Milwaukee Ave., Chicago 41, Ill.—12 page catalogue contains descriptions, photographs, and prices of steel shelving, clothing lockers, work benches and other steel equipment.

Crane Block. American Hoist and Derrick Co., St. Paul 1, Minn.—4 page Catalogue No. 300-16 describes and illustrates the Lo-Head crane block for crane operations. Specification table included.

Index to Volume Thirty-one of The Paper Industry

April, 1949—March, 1950

Page numbers in this index are preceded by numbers of the issues. April, 1949, is No. 1 and March, 1950, is No. 12

A

A-C motors for pulp and paper mills, how to select large..... 1, 61
Accident facts, finding of..... 8, 1001
Aderhold, Howard H., Marathon builds effective safety program..10, 1194
Adsorption chromatography of lignin 2, 205
Alkali deinking 3, 337
Aries, Robert S., and Pollak, Arthur, Commercial lignins
Part I 10, 1198
Part II 11, 1317
Asphalt roofing, how Bird makes....12, 1422

Association Meetings

CPPA and Technical Section hold annual meetings 11, 1328
Divisional group meetings..... 12, 1440
Divisional meetings of the Superintendents Association 9, 1091
Fourth TAPPI engineering conference 9, 1081
New York TAPPI meeting..... 12, 1409
Niagara branch host to summer meeting Canadian Technical Section 3, 353
Pacific coast is TAPPI host..... 7, 809
"Paper Week" record attendance marks 73rd APPA convention..12, 1407
Salesmen's Association holds 31st annual luncheon 12, 1438
Straw pulp conference at Terre Haute 9, 1087
Superintendents Association convenes in Atlantic City..... 4, 432
Thirty-first annual meeting of Canadian Woodlands Section.. 1, 73
Two-day TAPPI conference devoted to coating problems..... 2, 221
Atchison, Dr. Joseph E., Straw utilization in western Europe's pulp and paper industry
Part I 10, 1202
Part II 11, 1348

B

Bailey, A., Adsorption chromatography of lignin..... 2, 205
Bain, Walter M. *2—Baker, V. B. *3
Bark, dewatering with Stacom press 11, 1300
Barrett, W. A., see Spier, William
Barrow, H. P. *2
Battery trucks, use of gasoline contrasted with 12, 1464
Beath, L. R., and Hill, H. S., Electrical evaporation of waste sulphite liquor 6, 722
Beeman, D. L. *3
Bee, Edgar, Pulping of hardwoods in Australia 3, 343
Belvin, Charles H. *2
Berg, Harvey E., Slime treatment service 6, 687
Berger, R. C., Process control coordinated with electrical distribution 6, 680
Between the Lines
It's no use waiting . . . the stream won't dry up..... 1, 49
Bird makes asphalt roofing..... 12, 1422
Bishop, Fred W., see Thompson, J. J. *2
Blandin, groundwood bleaching at..11, 1353
Bleached straw, paper from..... 8, 928
Bleaching, groundwood at Blandin..11, 1353
Bleaching, low consistency; control of pH in..... 10, 1200
Bloomquist, W. C. *3
Board machine, Sutherland now operating giant new..... 5, 562
Board mill, new Weyerhaeuser at Springfield, Oregon 10, 1187
Board mill in Ohio, Fairfield starts new 2, 196
Brashares, C. A. *2
British suction unit is introduced in America 1, 58
Buckman Laboratories Staff, Evaluation and control of slime losses 8, 948
Bushman, A. K. *3

C

Carr, Ralph, Alkali deinking..... 3, 337
Carter, Roy, see Karassik, Igor J.
Centrifugal pump design..... 11, 1320
Centrifugal pump impellers..... 9, 1067
Centrifugal pumps 7, 825
Charts, use of in operation control..12, 1425
Chemicals for slime control..... 8, 952
Chemical toxicants for slime..... 6, 684
Chip weightometer, use of in kraft mill 10, 1243
Clark, S. *3
Coating of reproduction papers..... 5, 596
Coating process, new..... 2, 184
Commercial lignins
Part I..... 10, 1198
Part II..... 12, 1317
Compressed air in mill operations.... 9, 1075
Condensate contamination, how to prevent 12, 1428
Control of pH in low consistency bleaching 10, 1200

CONVENTION PAPERS, ABRIDGED

Technical Association of the Pulp and Paper Industry

Choosing the correct mechanical transmission method, William Staniar 1, 106
TAPPI Abstracts (Briefs of papers given before the annual TAPPI meeting of 1950)..... 12, 1470
Hydrapulper processing of straw, Carl G. Krancher, Carl E. Price.. 9, 1124
Industry's technical manpower, A. C. Monteith 1, 108

American Pulp and Paper Mill Superintendents Association

"Alpha" protein as a machine coating binder, Walter M. Bain..... 6, 741
Care and use of chipper knives, C. B. Newell..... 12, 1475
Casein in machine coating, H. O. Ware 9, 1128
Chipper drives, H. P. Barrow..... 11, 1355
Chips from veneer waste, James C. Hayes 11, 1354
Electroplating for paper machinery, Charles H. Belvin..... 5, 616
Enzyme-starch conversions and their application to machine coating colors, W. L. Craig..... 6, 740
Fabricating quality and performance into corrugated shipping containers, A. O. Parson..... 12, 1473
Felts and their relation to paper machine problems, L. M. Woodside 3, 381
Groundwood bleaching at Blandin, C. A. Richardson..... 11, 1353
Industrial protective organic coatings, H. W. Foelsch..... 9, 1125
Jordan plug pressure control system, Bruno E. Prevost..... 5, 614
Latex as an adhesive for machine coating of paper, Elmer K. Stilbert 6, 744
Lubrication and its effect on paper mill operating and maintenance costs, J. P. Critchlow and D. R. Kroell 5, 618
New method of coating paper involving ion exchange, a, D. Robert Erickson 6, 742
Paper machine developments, E. A. Hodge, P. Andrew Jackson, P. H. Goldsmith 2, 257
Plain press of tomorrow, the, J. V. Edge 9, 1120
Primer on stream pollution, Jesse M. Holderby 4, 509
Place and future of machine coating in the industry, the, B. R. Newcomb 6, 742
Power plant maintenance..... 6, 738
Refractory practice in the kraft mills, C. A. Brashares..... 9, 1122
Relationship between increased reuse of machine white water and slime control, the, Charles P. Kirchen 9, 1126
Revolving disc mills in straw pulp productions, C. K. Textor, L. Eberhardt 9, 1123
Roll type fiber press in straw pulping, F. L. Herman..... 9, 1124
Safety, crossing the imaginary line, Alvin Tuten 9, 1120
Trends in sulphite pulping, Vance P. Edwardes..... 5, 614
Use of chip weightometer in kraft mill operation, J. J. Thompson, Fred W. Bishop 10, 1243

(*) See Convention Papers . . . Abridged. (1) TAPPI; (2) Superintendents Association; (3) Miscellaneous

Miscellaneous

Can we plan on atomic power?, Harry A. Winne ... 7, 868
Champion process for machine coating, J. R. Simpson ... 3, 380
Cleaning and rust prevention, Robert G. Clendenin ... 9, 1128
Electronic speed regulators for sectional paper machine, V. B. Baker, C. F. Kovalsky ... 1, 111
Engineering, co-operation and mutual assistance, A. K. Bushman ... 7, 864
Finding the accident facts, E. A. Page ... 8, 1001
Groundwood mill and screen room heating and ventilation, S. Clark ... 4, 506
Higher mill efficiencies and the gas turbine, W. C. Bloomquist ... 7, 862
Less work for the operator means more production, G. E. Shaad ... 7, 862
Mid-States gummed paper company, Burton Lee Trodson ... 4, 512
More usable power, greater protection and better service continuity by applying modern distribution systems, D. L. Beeman ... 7, 866
Plant layout from a materials handling standpoint, Everett Laitala ... 3, 383
Protect your personnel and electrical equipment throughout the mill, G. W. Knapp ... 7, 864
Safety of American freedom is everybody's job, Donald J. Hardenbrook ... 8, 992
Specific safety techniques, Edward G. Holtzman ... 8, 996
Technology in the Japanese pulp and paper industry, Harold R. Murdock ... 7, 868
Technique of marking shipments, E. J. Marsh ... 4, 508
Unusual accidents in paper mills, O. J. Sherman ... 8, 994
Why pay more to handle your materials?, H. D. Putnam ... 7, 866

Corrugated board from semichemical pulp ... 7, 818
Craig, W. L. *2
Critchlow, J. P., Kroell, D. R., Lubrication and its effect on paper mill operating and maintenance costs ... 5, 618
Crowley, E. L., Control of pH in low consistency bleaching ... 10, 1200
Crown Zellerbach, new wood mill ... 8, 940

D

Davis, D. S., Loss in head on pumping fibrous suspensions ... 11, 1306
Davis, H. G., see Murphy, E. K.
Deinking at the St. Regis Paper Co. (pictorial) ... 3, 334
Deinking of printed papers—a symposium ... 3, 329
Dornell, Every, Review of 1949 in the unbleached kraft paper industry ... 12, 1469
Dewatering bark with a Stacom press ... 11, 1300
Downtime reduced through stocking motor renewal parts ... 4, 465
Dutruc, James H., The French paper industry today ... 2, 202
Economic review of the industry . . . 1949 ... 10, 1178

E

Edge, J. V. *2
Editorials
Advertising and public service ... 7, 787
After thirty years— ... 8, 917
America increases its economic area ... 11, 1289
An enlarged safety program ... 1, 35
Better business balance ahead ... 2, 179
Business emerging from the deep freeze ... 6, 657
Do the signs point to a second recession? ... 8, 917
Emphasis on free enterprise ... 7, 787
For better labor relations ... 9, 1045
Give to those who gave ... 8, 919
Have we stopped wasting our timber wealth? ... 6, 657
Higher taxes—lower production ... 3, 317
How money grows on trees ... 9, 1047
Individual freedom . . . or government control? ... 9, 1045
It is time the tide was turning ... 4, 431
Must we lose our trees? ... 11, 1287
Other fellow's problems ... 8, 919
Paper production back to par ... 10, 1171
Paper products facing increasing consumption ... 7, 789
Safety starts at the top ... 8, 919
Some thoughts for the new year ... 10, 1173
The benign "dis-inflation" ... 1, 35
The dawn came up like thunder ... 12, 1399
The meeting season ... 6, 659
The Paper Industry—new year, new title ... 10, 1173
Where are we going? ... 5, 561
Edwardes, Vance P. *2
Eberhardt, L., see Textor, C. K.
Efficiency, increased by good lighting ... 12, 1430
Electrical distribution, process control co-ordinated with ... 6, 680
Electrical evaporation of waste sulphite liquor ... 6, 722
Erickson, D. Robert *2
Evaluation and control of slime losses ... 8, 948

F

Fairfield starts new board mill in Ohio ... 2, 196
Fibrous suspension, loss in head on pumping ... 11, 1316
First world conference on wood pulp problems ... 2, 180
Foelsch, H. W. *2
Foremen's contest improves operation ... 4, 464
Forest management, why ... 11, 1314
French paper industry today, the ... 2, 202
Fundamentals of lime kiln thermodynamics ... 9, 1070
Fundamentals of slime control ... 5, 600

G

Gasoline vs. battery power for industrial trucks ... 12, 1464
G-E invites paper men to electrical conference ... 7, 794
German cellulose industry, the ... 3, 373
Gibbs, Ralph, Fundamentals of lime kiln thermodynamics ... 9, 1070
Gillaspie, A. G., Chemicals for slime control ... 8, 952
Glendenin, Robert G. *3—
Goldsmith, P. H. *2
Good lighting increases efficiency ... 12, 1430
Goy, Otto, German cellulose industry, the ... 3, 373

H

Hall, William G., Downtime reduced through stocking motor renewal parts ... 4, 465
Hardenbrook, Donald J. *3
Hardwood pulping in Australia ... 3, 343
Hayes, James C. *2—
Herman, F. L. *2
High speed coating of reproduction papers ... 5, 596
Hill, H. S., see Beath, L. R.
Hill, L. E., Jr., Types of hydraulic barkers and how they work ... 9, 1062
Hodge, E. A. *2—
Holderby, Jesse M. *2—
Holtzman, Edward G. *3
How Bird makes asphalt roofing ... 12, 1422
How to prevent condensate contamination ... 12, 1428
How to select large A-C motors for pulp and paper mills ... 1, 61
Hummel, Fred E., Magnetic separators eliminate tramp iron ... 8, 946
Hydraulic barkers, types and operation ... 9, 1062

I

Industrial truck batteries, maintenance of ... 9, 1077
Industry, economic review for 1949 ... 10, 1178
Industry research conference, University of Maine ... 9, 1052
Insulation, power plant; prevents heat losses ... 7, 828
International Review ... 1, 99; 2, 253; 3, 373; 4, 501; 5, 611; 7, 854; 8, 986; 9, 1113; 10, 1223; 11, 1345; 12, 1461
Irmiter, Richard, Maintenance in plant washrooms ... 4, 461

J

Jackson, P. Andrew *2—
Jordan, William P. *2

K

Karassik, Igor K., Carter, Roy, Pumps and how they work ... 5, 603
Designs and functions of pump casings ... 6, 689
Multistage pumps ... 7, 825
Centrifugal pump impellers ... 9, 1067
Centrifugal pump design ... 11, 1329
Kauffmann, H. O., McEwen, R. L., Sheldon, F. R., Peroxides in deinking ... 3, 338
Kimberly-Clark Corp., LongLac pulp mill rounds out integrated operation of ... 1, 36
Kipp, Robert, Regular cleaning prevents slime troubles ... 6, 686
Kirchen, Charles P. *2—
Knapp, G. W. *3—
Kovalsky, C. F. *3
Kraft mill operation, use of chip weightometer in ... 10, 1243
Kraft paper, review of unbleached industry, 1949 ... 12, 1469
Krancher, Carl G., Price, Carl E. *1
Kroell, D. R., see Critchlow, J. P.
Kuebler, J. W., Foremen's contest improves operation ... 4, 464

L

Laitala, Everett *3
Lawsuits affecting paper and pulpwood industry ... 8, 943
Lignin, adsorption chromatography of ... 2, 205
Lignins, commercial ... 10, 1198
Lime kiln thermodynamics, fundamentals of ... 9, 1070
LongLac pulp mill rounds out integrated operation of Kimberly-Clark Corp. ... 1, 36
Loss in head on pumping fibrous suspensions ... 11, 1316

Mc

McClelland, W. B., Gasoline versus battery power for industrial trucks ... 12, 1464
McEwen, R. L., see Kauffmann, H. O.
McKee, William N., Chemical toxicants for slime ... 6, 684
McLintock, T. F., Why forest management? ... 11, 1314

M

Macon, making paperboard at ... 4, 452
Magnetic separators eliminate tramp iron ... 8, 946
Maintenance in plant washrooms ... 4, 461
Maintenance of industrial truck batteries ... 9, 1077
Making paperboard at Macon ... 4, 452

(*) See Convention Papers . . . Abridged. (1) TAPPI; (2) Superintendents Association; (3) Miscellaneous

Marathon builds effective safety program 10, 1194
Marsh, E. J. *3
Meister, Harry, see Smith, Milton
Model paper mill part of Western Michigan College's newly-dedicated science building 8, 824
Monteith, A. C. *1
Moriarity, T. F., Pallets save money 7, 831
Multistage pumps 7, 825
Murdock, Harold R. *2
Murphy, E. K., Davis, H. G., High speed coating of reproduction papers 5, 596

N

Nadelman, Alfred H., Principles and practice of deinking processes 3, 330
National Safety Council 37th annual congress 8, 957
Neutral sulphite semichemical pulping process 2, 210
New board mill at Springfield, Oregon 10, 1187
New coating process 2, 184
Newcomb, B. R. *2—
Newell, C. B. *2
New Equipment and Supplies
1, 116; 2, 262; 3, 384; 4, 514; 5, 621; 6, 746; 7, 877; 8, 1004; 9, 1130; 10, 1244; 11, 1356; 12, 1477
New mill in South America makes paper from bleached straw 8, 928
New process for making white liquor 1, 64
New Publications
1, 124; 2, 268; 3, 390; 4, 520; 5, 627; 6, 752; 7, 883; 8, 1010; 9, 1140; 10, 1252; 11, 1366; 12, 1484
Newsprint paper in 1949 ..... 12, 1466
New wood mill at Crown Zellerbach, Camas 8, 940

O

O'Donoghue, Roderick, Printing inks 3, 336
Operation studies, use of charts in..12, 1425
Oscarson, G. L., How to select large A-C motors for pulp and paper mills 1, 61

P

Page, E. A. *3
Palladino, A. J., Waste disposal problems 3, 341
Pallets save money 7, 831
Paper and paperboard making—I ..12, 1481
Paper Sketches
1, 67; 2, 214; 3, 346; 4, 469; 5, 608; 6, 693; 7, 832; 8, 955; 9, 1079; 10, 1204; 11, 1324; 12, 1434
Parker, Leo T., Review of new lawsuits affecting the paper and pulpwood industry 8, 943
Parson, A. O. *2
Patch, C. E. "Dan", Scale models aid wood handling problems.... 5, 606
Use of charts in operation studies 12, 1425
Peroxides in deinking 3, 338
Perry, Henry J., Neutral sulphite semichemical pulping process..... 2, 210
pH: control of in low consistency bleaching 10, 1200
Pollak, Arthur, see Aries, Robert S.
Power plant insulation prevents heat losses 7, 828
Practical Shorts
1, 97; 2, 251; 3, 371; 4, 499; 5, 609; 6, 719; 7, 853; 10, 1221; 11, 1343
Prevost, Bruno E. *2—
Price, Carl E., see
Krancher, Carl G. *1
Principles and practice of deinking processes 3, 330
Printing inks 3, 336
Process control co-ordinated with electrical distribution 6, 686
Progress at Thilmany 1, 51
Protection from skin hazards 9, 1074
Pulping of hardwoods in Australia.. 3, 343
Pumps and how they work 5, 603
Pump casings, designs and functions of 6, 689
Pump impellers, centrifugal 9, 1067
Putnam, H. D. *3
Pyrometry, thermoelectric 4, 459

R

Rating a lift truck 3, 378
Recession, lessons from 1949 ..... 12, 1404
Regular cleaning prevents slime troubles 6, 686
Reproduction papers, high speed coating of 5, 596
Review of 1949 in the unbleached kraft paper industry 12, 1469
Review of new lawsuits affecting the paper and pulpwood industry 8, 943
Richardson, C. A. *2
Rittman, M. B., Safety contest pays off 1, 57
Roberts, C. C., Vogelsang, C. A., Thermoelectric pyrometry 4, 459

S

Safety contest pays off 1, 57
Safety Contest Scores
1, 86; 2, 234; 3, 350; 4, 486; 5, 592; 6, 710; 7, 850; 8, 961; 9, 1110; 10, 1208; 11, 1341; 12, 1458
Scale models aid wood handling problems 5, 606
Safety program at Marathon 10, 1194
Schweisheimer, Dr. W., Protection from skin hazards 9, 1074
Good lighting increases efficiency 12, 1430
Semichemical pulping process, neutral sulphite 2, 210
Shaad, G. E. *3
Sheldon, F. R., see Kauffmann, H. O.
Shema, B. F., Fundamentals of slime control 5, 600
Sherman, O. J. *3
Silicates in deinking 3, 340
Simpson, J. R. *3
Skin hazards, protection from 9, 1074
Slime control, chemicals for 8, 952
Slime control, fundamentals of 5, 600
Slime control, practical (symposium)
Chemical toxicants for slime 6, 684
Regular cleaning prevents slime troubles 6, 686
Slime treatment service 6, 687
Slime losses, evaluation and control 8, 948
Slime treatment service 6, 687
Smith, Milton, Meister, Harry, Rating a lift truck 3, 378
Some lessons from the 1949 recession 12, 1404
Sonoco makes nine-point corrugated board from semichemical pulp 7, 818
Spaulding installs new hydraulic barker 8, 954
Spier, William, British suction unit is introduced in America 1, 58
Stacom press, dewatering bark with 11, 1300
Staniar, William *1
Stevens, W. O., Power plant insulation prevents heat losses 7, 828
Stevenson, Dr. Louis T., Some lessons from the 1949 recession 12, 1404
Stilbert, Elmer K. *2
Straw utilization in western Europe's pulp and paper industry
Part I 10, 1202
Part II 11, 1348
Sulphite liquor, electrical evaporation of waste 6, 722
Sulphite semichemical pulping process, neutral 2, 210
Sutherland now operating giant new board machine 5, 562

T

Textor, C. K., see Eberhardt, L.
Thermoelectric pyrometry 4, 459
Thilmany, progress at 1, 51
Thompson, J. J., Bishop, Fred W. *2
Tramp iron, elimination of 8, 946
Tree planting tips 7, 860
Trucks, industrial; use of battery or gasoline 12, 1464
Trodson, Burton Lee *3
Turley, Everett L., Silicates in deinking 3, 340
Tuten, Alvin *2
Types of hydraulic barkers and how they work 9, 1062

U

Unbleached kraft paper, review of 1949 in industry 12, 1469
University of Maine holds industry research conference 9, 1052
Use of charts in operation studies 12, 1425

V

Veneer waste, chips from 11, 1354
Vogelsang, C. A., see Roberts, C. C.

W

Ware, H. O. *2
Washrooms, maintenance in plant.. 4, 461
Waste disposal problems 3, 341
Welsh, J. N., How to prevent condensate contamination 12, 1428
Western Europe, utilization of straw in pulp and paper industry
Part I 10, 1202
Part II 11, 1348
Western Michigan College, model paper mill part of new science building 8, 924
Weyerhaeuser, new board mill 10, 1187
White liquor, new process for making 1, 64
Why forest management? 11, 1314
Williamson, Harry, Paper and paperboard making—I 12, 1481
Wilson, Elwood, Tree planting tips.. 7, 860
Winne, Harry A. *3
Wood handling problems, scale models aid 5, 606
Wood pulp problems, first world conference on 2, 180
Woodside, L. M. *2

Z

Zink, J. J., Newsprint paper in 1949 ..... 12, 1466

(*) See Convention Papers . . . Abridged. (1) TAPPI; (2) Superintendents Association; (3) Miscellaneous

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Corduroy, Ladies'	3.75 to 4.00
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Percales	6.00 to 6.25
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White Shrunk	10.25 to 10.75
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Miscellaneous	2.25 to 2.50
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Miscellaneous	3.25 to 3.50
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Repacked	3.25 to 3.50
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Light Flannelettes	
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New White Cuttings	
New Light Oxfords	
New Light Prints	

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No. 2 White Linens	
No. 3 White Linens	
No. 4 White Linens	
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No. 2 White Cottons	
No. 3 White Cottons	
No. 4 White Cottons	
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Ord. Light Prints	
Med. Light Prints	
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French Blue Cottons	
French Blue Linens	
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Linsey Garments	
Dark Cottons	
Old Shopperies	

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No. 1 small	4.50 to 4.75
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Dry, barrels	85.00—
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20-30 mesh (bags), lb.	
80-100 mesh (bags), lb.	23.00 to 24.00
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Bailey Meter Company
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Bauer Bros. Co., The 101
Beloit Iron Works 1
Bird Machine Company 47
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Black-Clawson Co., The 8
Boston Woven Hose & Rubber Co.
Bowser, Incorporated 44
Bowsher Co., The N. P. 82
Brown Instruments Division, Minneapolis-Honeywell Regular Company 11

Cady and Company, E. J. 110
Cameron Machine Co.
Carthage Machine Co.
Chain Belt Company 65
Cheney Bigelow Wire Works
Chicago Bridge & Iron Company 2
Clark Equipment Company, Industrial Truck Division
Classified Advertising 110
Coes Company, Loring 103
Continental Foundry & Machine Co. 82
Curlator Corporation 25

Darnell Corporation, Ltd.
Dempster Brothers, Inc. 77
DeZurik Shower Company
Dicalite Div., Great Lakes Carbon Corp. 105
Dietert Co., Harry W.
Dilts Machine Works 8
Downingtown Mfg. Co. 6
Draper Brothers Company
du Pont de Nemours & Co., E. I. 13, 26
Duriron Co., Inc., The

Eastwood-Nealley Corporation 92
English China Clays Sales Corp. 82

Farquhar Co., The A. B. 99
Fawick Airflex Company, Inc. 33
Federal Products Corporation
Federated Metals Division, American Smelting and Refining Company 85
Fischer & Porter Co.
Fitchburg Screen Plate Co., Inc.
Fleisbel Lumber Company 76
Foxboro Company, The
Fritz Publications, Inc. 85, 113

Garlock Packing Co., The
General Chemical Division, Allied Chemical & Dye Corporation 30
Glidden Company, The 111
Goulds Pumps, Inc. 89

Hanchett Manufacturing Co. 99
Harrington & King Perforating Co. 81
Harris-Seybold Company ..... 2nd Cover
Hercules Powder Company
Hills-McCanna Company
Hooper & Sons Co., Wm. E. ..... 3rd Cover
Hubinger Company, The 87
Hudson-Sharp Machine Company 87
Hunt Machine Co., Rodney 100
Huyck & Sons, F. C.

Infilco, Incorporated 18
Ingalls Iron Works Company 112
International Nickel Co., Inc.

Jeffrey Mfg. Co., The
Jenkins Bros. 4
Jenssen Company, Inc., G. D. 81
Johnson Corporation, The 28
Jones Foundry & Machine Co., W. A. 17

Kalamazoo Tank & Silo Co.
Kelco Company 20
Koppers Company, Inc. 9

Langston Co., Samuel M.
Layne & Bowler, Inc. 103
Lewellen Manufacturing Co.
Lindsay Wire Weaving Co., The 101
Link-Belt Company ..... 4th Cover
Lockport Felt Company
Lodding Engineering Corp.
Lunkenheimer Co., The 49

Magnus Metal Corporation
Mason-Neilan Regulator Company
Mathieson Chemical Corporation
Michigan Steel Casting Co. 90
Midwest Piping & Supply Co., Inc.
Minneapolis-Honeywell Regulator Co. 11
Mixing Equipment Co., Inc. 97
Morden Machines Company 69
Mt. Vernon-Woodberry Mills, Inc. 10
Murray Mfg. Co., D. J.

Nash Engineering Co., The 87
National Aluminate Corporation 7
National Aniline Division, Allied Chemical & Dye Corp.
National Safety Council, Inc. 80
Naylor Pipe Company 95
Norton Company
Nugent & Company, Inc., Wm. W. 105

(Continued on facing page)

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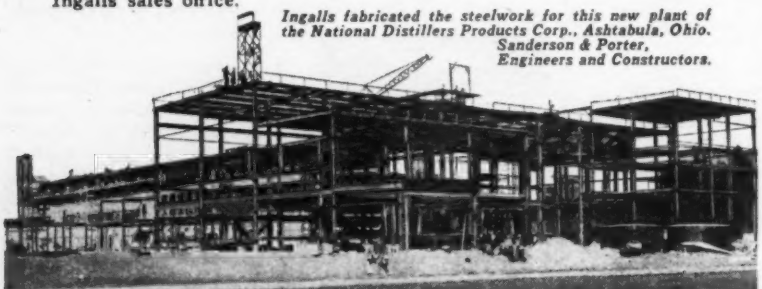

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Perkins & Son, Inc., B. F. 16
Permutit Company, The
Pittsburgh Piping & Equipment Co. 73
Poole Foundry & Machine Co. 99
Powell Company, The Wm. 70
Pusey & Jones Corp., The 43

Rice Barton Corporation
Rice Barton Research Corp.
Rogers & Co., Samuel C. 81
Rohm & Haas Company, Resinous Products Division
Roots-Connersville Blower Corp. 93
Ross Engineering Corp., J. O.
Ross Heater & Mfg. Co., Inc.
R-S-Products Corporation 79

St. Regis Paper Company 22
Sandusky Foundry & Machine Co.
Sandy Hill Iron & Brass Works, The 5
Shartle Bros. Machine Co. 8
Shuler & Benninghofen 24
SKF Industries, Inc. 12
Smith & Winchester Mfg. Co.
Smith Corporation, A. O. 15
Solvay Sales Division, Allied Chemical & Dye Corporation 81
Standard Oil Co. (Indiana) 114
Stein, Hall & Company, Inc.
Stickle Steam Specialties Co. 103
Stowe-Woodward, Inc.
Sutherland Refiner Corporation 23
Swenson Evaporator Company ..... 1st Cover

Timken Roller Bearing Co., The
Titanium Pigment Corporation
Torrington Co., Bantam Bearings Division
Tracerlab, Inc.
Turner Halsey Company 10

U.S.A.—Treasury Dept.
U. S. Stoneware Co. 32

Valley Iron Works Company 75
Vanderbilt Co., Inc., R. T.

Waldron Corporation, John
Waterbury & Sons Co., H. 82
Waterbury Felt Co., The 87
Western Precipitation Corp.
Weyerhaeuser Timber Co. 19
Whiting Corporation ..... 1st Cover
Williams-Gray Company
Worthington Pump & Machinery Corp.
Wyandotte Chemicals Corporation

Yarnall-Waring Company
Youngstown Welding & Engineering Co., The 97

Professional and Business Services

Bjorksten Research Laboratories 106
Clark & Company, Wallace 106
Dreshfield, Arthur C. 106
Guest & Sons, C. M. 106
Wierk, Frederick 106

The 1949-50 Edition . . .

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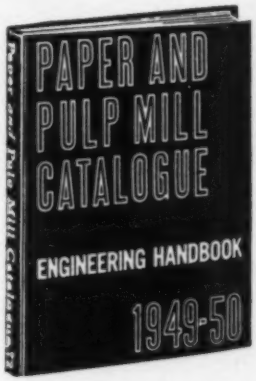

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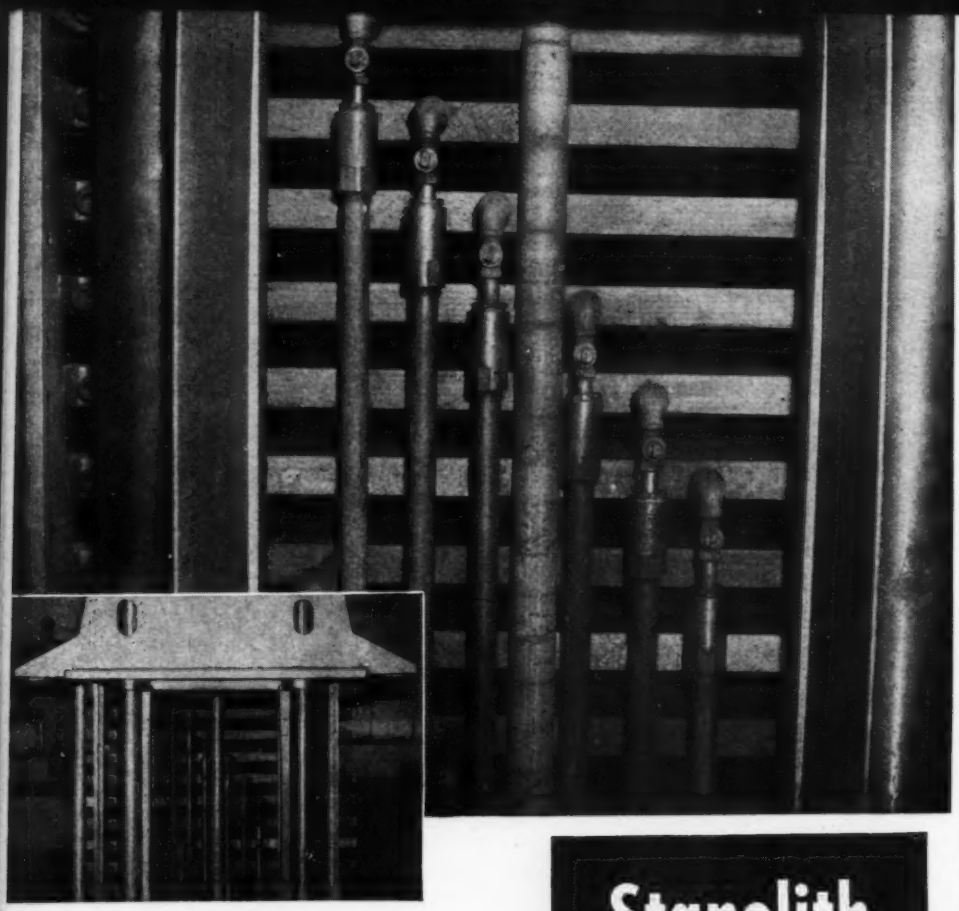

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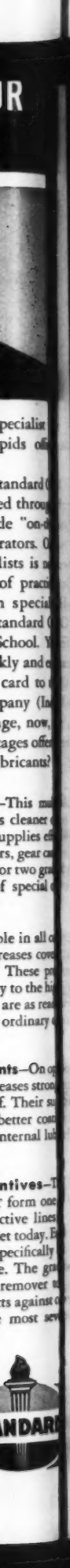

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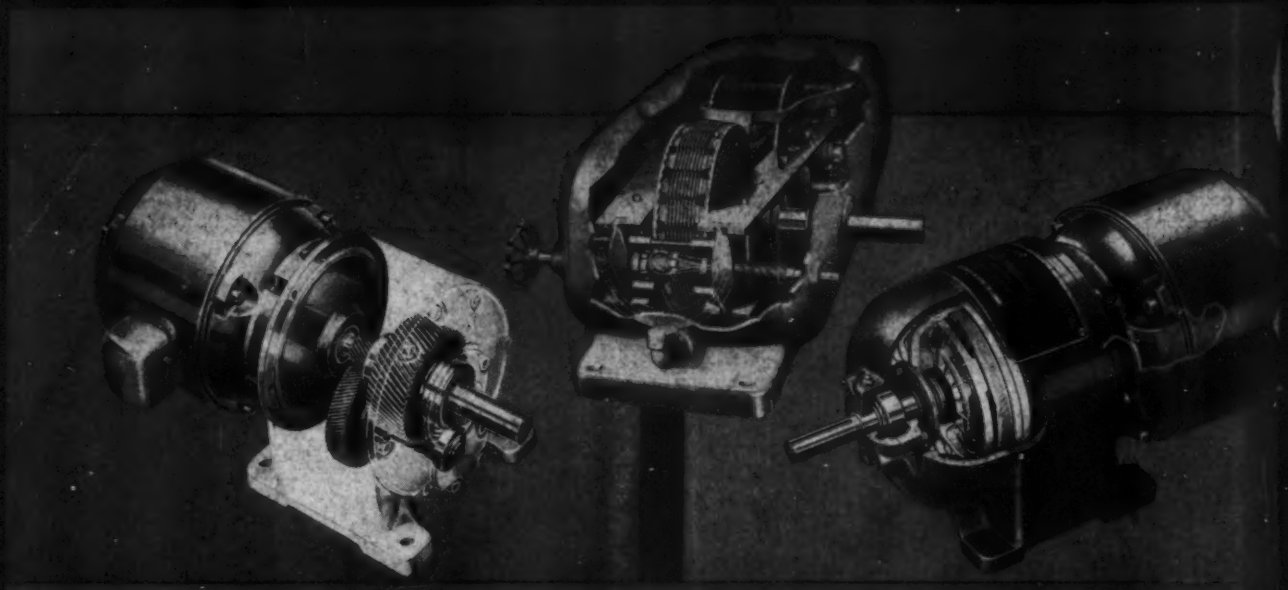

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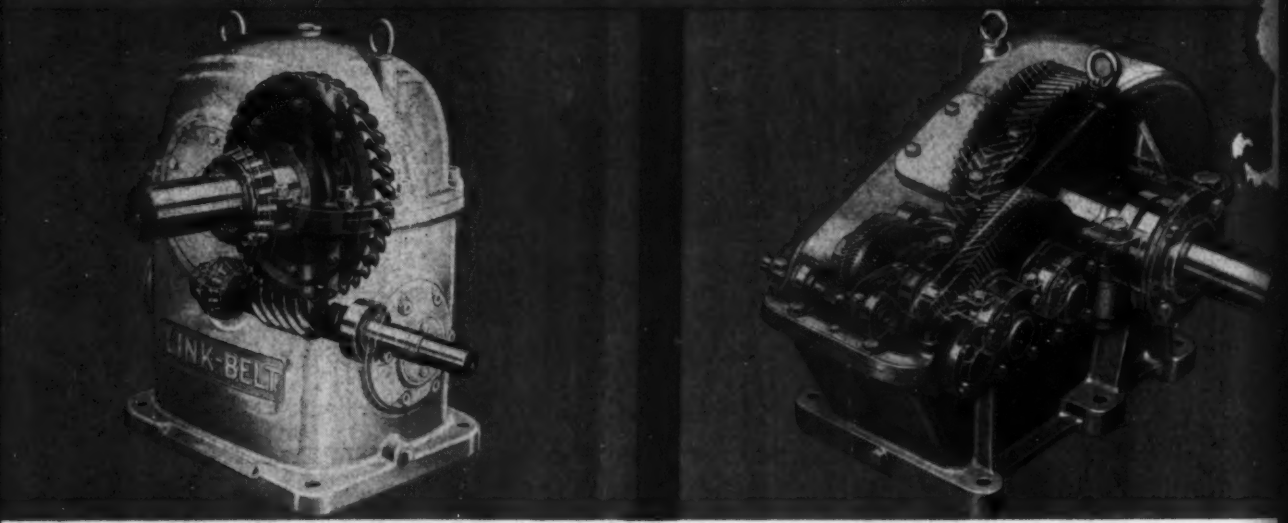

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